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IMPROVED DEPOSITING DRY DOCK.

The dock consists of an upright side carrying the machinery, and having attached to it a series of parallel pontoons forming the bottom on which the vessel is lifted; on the other side of the dock is an outrigger which always floats, and the function of which is to insure stability during the operations of raising and lowering vessels. The dock is lowered as required, and a vessel brought over the pontoons and properly secured; pumping is then proceeded with till the vessel is raised well above water, as shown in the view. The pontoons of the dock are now entered between the piers of the fixed staging, so that the vessel is brought over the latter; water is then admitted to the dock to lower it, and thus the vessel is quickly transferred from the floating dock to the fixed staging without any sliding or rolling motion. The reverse of this is done when a vessel is lifted off the staging into the water. The operation occupies only about twenty minutes, and the vessels can be left on the staging as long as may be desired. Our illustration, for which we are indebted to *Engineering*, shows the steamship Pensher on the dock, and the steamship Ardeer deposited on the staging.

This dock is the third of its kind constructed by its inventors, Messrs. Latimer Clark and John Standfield, of Westminster. The first was completed at Nicolaieff in the the Black Sea for the Russian Government, where it proved of great service during the Russo-Turkish war; it was subsequently removed to the more important arsenal of Sebastopol and considerably enlarged; it is now in constant use at that port. The second was shipped to Vladivostok, the chief Russian port in the Corea, where it is now being put together; it has been provided with a complete repairing workshop to be carried on the outrigger.

The dock has been in constant use during the short time since its completion, and it has been already decided to extend it so that it shall be able to dock and deposit vessels of 5,000 tons weight. Contracts have also been entered into for the construction of further lengths of staging.

The dock consists of two equal parts, each complete, and these are frequently used separately for docking and depositing vessels of 1,500 tons dead weight; the intended addition will be in the form of another independent section suitable for vessels of 2,000 tons. When the three parts are connected together, they will be able to lift vessels of 5,000 tons, as already stated. It is obvious that every additional length of staging gives the accommodation of another graving dock and at a trifling cost, as the staging is constructed of ordinary piles driven in parallel rows, which are capped by horizontal timbers. This is clearly seen in our perspective view. By this arrangement one dock serves for a large number of vessels, and can thus be very economically and profitably worked.

Decorating Zinc Articles.

A beautiful and permanent dark or light green coating, resembling enamel, can be applied to all kinds of zinc articles, especially those made of sheet zinc, says Puscher, in the following manner:

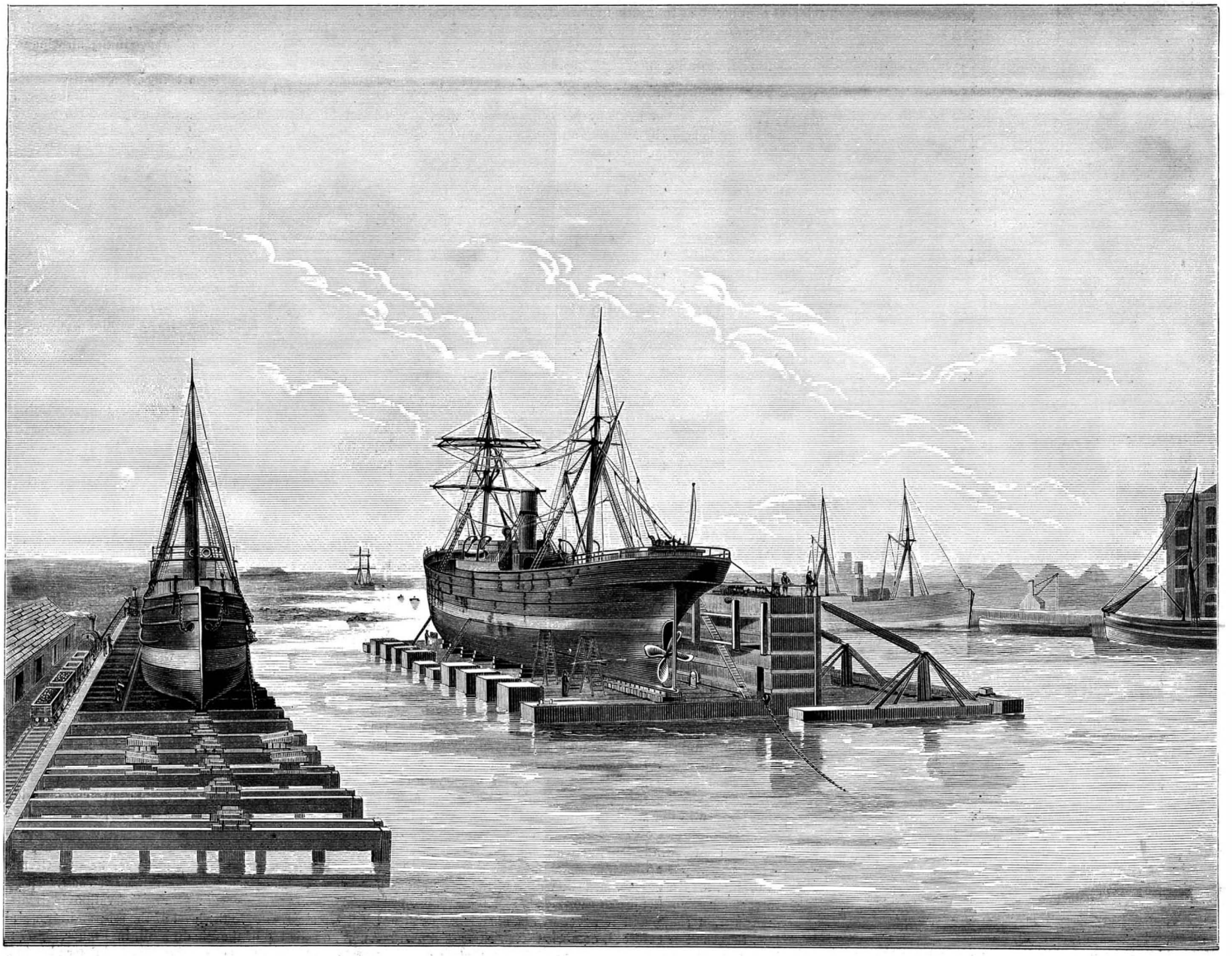
Fifty parts of hyposulphite of soda are dissolved in 500 of boiling water, and the solution poured at once, in a fine stream, into 25 parts of strong sulphuric acid. The milk of sulphur that separates will soon ball together in lumps and settle. The hot liquid containing sulphate of soda and sulphurous acid is decanted, and the cleansed zinc put in it. In a short time it will acquire a very brilliant, light green coating of sulphide, and only needs to be washed and dried. By exposing it repeatedly and for a longer time to this hot bath, the coating grows thicker and the color darker and more brilliant. The temperature must not fall below 145° Fahr.; when it does, it should be heated up to 190° Fahr., to obtain a fine and brilliant deposit.

By dipping these articles in dilute hydrochloric acid, one of acid to three of water, sulphureted hydrogen is evolved, and this enamel-like coating loses its luster and gets lighter in color. Aqueous solutions of aniline colors have little effect upon this dull surface and none on the gray brilliant coating.

The effect of marbling can be obtained by moistening the gray zinc and applying hydrochloric acid in spots with a sponge, then rinsing it off, and while still wet flowing over it an acidified solution of sulphate of copper, which produces the appearance of black marble. As the zinc has generally a dull surface it must receive a coat of copal varnish.

If 15 grammes of chrome alum and 15 more of hyposulphite of soda be added to the above solution, the article will have a brownish color. The above can all be applied to articles made of cast zinc.—*Neueste Erfind.*

M. VICTOR SAINT PAUL has placed $5,000 at the disposal of the Paris Academy of Medicine as a prize to any person, whatever may be his vocation or nationality, who shall succeed in discovering an infallible means of curing diphtheria.



CLARK & STANDFIELD'S IMPROVED DEPOSITING DRY DOCK.

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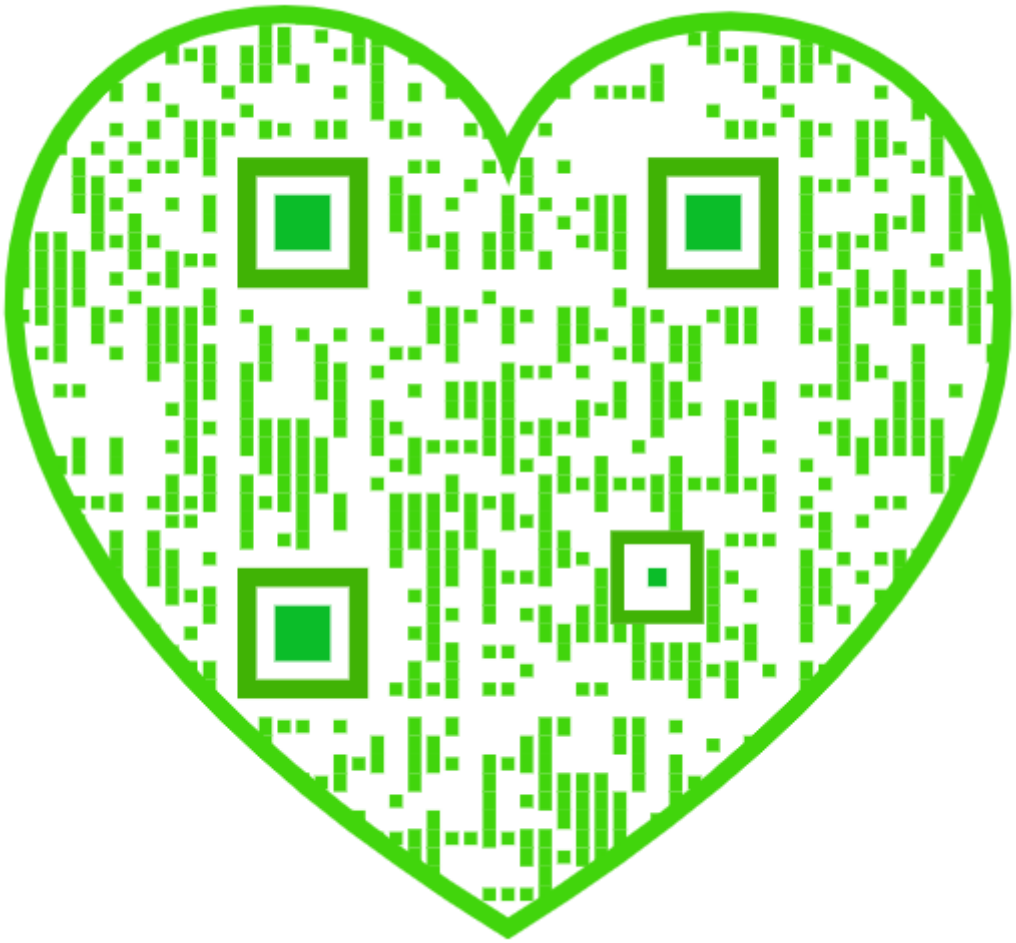

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FORGING BY PRESSURE.

The Collins Company, Collinsville, Connecticut, make the adz shaped heads of pickaxes by pressure instead of by percussion. A square bar of Norway iron, one and three-eighths inches diameter, is heated to a softening red heat, placed between clamping jaws forming a matrix of the shape and dimensions of the ax head, and a punch propelled by an eccentric and lever moves forward and forces the iron into the mould, or matrix, the punch being the size and shape of the handle hole. The action of the punch, or movable die, is not rapid—no more so than the movement of ordinary punching presses or cutting shears for boiler plate—it is a pushing or pressing movement, and in no sense a blow. The effect, however, is to form from the inch and three-eighths bar a head two and a half inches deep with a lozenge-shaped eye three by one and an eighth inches. The longitudinal fibers of the iron are not broken, but are bent so as to follow the contour of the projecting portion of the head. The advantages of this method, in this instance, are that no appreciable portion of the iron is wasted by forging down from a wide bar and punching the eye from the solid, a saving of labor, and a gain of strength by preserving the continuity of the fibers of the iron. There may be many other instances in which the forging by pressure would be preferable to forging by percussion.

THE GREEN MOUNTAIN RAILWAY.

This road leads from the shore of Eagle Lake to the summit of Green Mountain, on the island of Mount Desert, Me. The survey was made last winter by Alden F. Hilton, C.E., and the construction was carried forward under the supervision of Warren Nickerson, C.E. For the most part the roadway is constructed upon the solid ledge, to which the string pieces are secured by 1¼ inch iron bolts every six feet. Where the stringers are above the surface, bed ties are used every six feet; and back of every tie on all the ledges two and three 1¼ inch bolts are set into the ledge.

All longitudinal timbers are bolted to the bed ties, and every timber resting on the ledge was carefully fitted to its inequalities. The track ties are six inches square by six feet long, and are laid upon the stringers two feet apart, center to center. The ties are grooved to prevent lateral motion and are bolted to the stringers by two ⅞ inch bolts.

The ordinary T-rail is used, the gauge being 4 feet 7½ inches. The rails are coupled by the common style of fish plate, and fastened to the ties by spikes, two in each end of every tie. The cogs are of 1¼ inch iron, made in the same set of rolls, so as to insure uniformity. They are held between two angle iron plates, which are secured to the ties by lag screws 5½ inches long, 14 screws being in every section of 12 feet. If a locomotive set in the "forward gear" be pulled backward, the cylinder acts as an air pump, forcing air into the boiler. This fact is made use of on this road. The ascent is made by steam in the usual way, but the descent is made by allowing a reduction of pressure to take place, the engine being always set to go forward. The engine (built by the Manchester Locomotive Works) has four cylinders, two cog wheels, and two driving shafts, so that the breaking of one part would still leave a reserve. There is an intermediate gear between the shafts and axles of the cog wheels. On the cog wheel axles are two ratchet wheels on which two pawls are constantly dropping, either of which is strong enough to hold the train on any of the grades. As additional safety appliances there are two band brakes that can be instantly applied by the engineer.

The cars were built by the Hinckley & Egery Iron Company, and have floors adjusted to the average grade, the side being open to permit observation. The car is pushed ahead by the engine It is provided with double hand brakes, two cog wheels, and a pawl and ratchet capable of holding the car on the steepest grade if the engine should get away.

SELF-IMPOSED RISKS.

Railroads are built for a well defined, specific purpose, which does not include their use for pedestrianism. This principle is so well recognized in Europe that it is made by law a penal offense—in England and in some Continental countries—for persons to walk on the tracks. In this country there are portions of railroad tracks, particularly in the vicinity of manufactories, that are so constantly trodden that the earth has become almost as solid as a pavement. The railroad managers put up warning signs, but they are disregarded, and once in a while "an awful accident" horrifies the community; a man or a woman walking on the track is torn to pieces by the remorseless locomotive, one track having a train coming in one direction and another track one going in the other direction, a step on to either track being probably fatal. There is a curve under a high bank, in close vicinity to a railroad depot, which is occupied by two important railroads with their network of tracks, and at no hour of the day are all these tracks clear. This curve leads to large manufactories, and the roadbed is the common route of at least two thousand workmen twice if not three times a day. On account of the killing of two persons who were walking the track, the railroad companies were blamed and the managers put up warning signs—as far as they could go in prohibition, in the lack of law, with its penalties and enforcements. Yet the use of the track is in nowise abated for a pedestrian route, and it never will be abandoned until a law, that shall be enforced, compels these riskers of life and limb to use the general and public highway, that is a trifle longer but is absolutely safe.

In many of our railroad stations—"union depots"—several trains on different roads meet, or else they pass with only a moment's interval. Crossing from side to side of such a station is very common; sometimes by persons carrying loads of baggage. Miscalculating the speed of a locomotive, even at its slowing-up pace, perhaps gauging its velocity by that of a horse, they are overtaken unexpectedly, and if not killed are seriously hurt.

The getting on to cars when in motion is another method of risking limb and life without proper cause. The feat of swinging on to a railroad car in motion, which looks so easy and so graceful when practiced by an agile conductor or an ambitious brakeman, is one difficult to the occasional traveler; and yet there are plenty of men who think it shows a sort of independence to wait until the train starts before saying good-by to friends.

Probably the foolish practice of jumping from an arriving train before it comes to a stop is the occasion of a large number of vexatious if not of serious accidents. It is still practiced, however, by those who learn nothing either by experience or by observation. On this subject the *National Car Builder* says:

"We are not in favor of excessive precautionary measures, such as locking people in cars when traveling, or fettering the free movement of a thousand sensible persons in order that one person with no sense may be kept from hurting himself. The desired end could be reached by subjecting the one foolhardy and stupid individual to a light penalty rather than give inconvenience and trouble to a vastly greater number who need no protection."

CARBONIC ACID IN THE AIR.

The composition of the atmosphere was one of the first problems which scientific chemistry, in its origin more than a hundred years ago, set itself to solve; so far from being definitely settled, this problem offers to-day a field in which the accumulated knowledge and invention of a century finds ample room for its exercise in investigation.

The study of this apparently simple question has involved the settlement of so many related points, that the science of chemistry may almost be said to have been built up about it.

More than one hundred years ago the foundations of chemistry as a science were laid by Black, Priestley, and Lavoisier, in applying exact methods to the study of the composition of the air; and their successors have handed down a record of determinations of oxygen, increasing in accuracy until those of Regnault seem to leave little to be desired.

Apart from oxygen and nitrogen, the chief components of the air, there is but one other substance in dry air which we are at present warranted in regarding as a necessary and constant component, namely, carbonic acid or carbon dioxide (CO_2). Small as its proportion is, however, in the air, its relation to animal and vegetable life on the earth has long been recognized.

All gases occurring in the air, except those already mentioned, are either accidental in their occurrence or are subject to such variation and occur in such minute proportions, that their relation to the air or the laws which govern their variations have never been clearly made out. Ozone and peroxide of hydrogen, oxides of nitrogen, ammonia, and its salts, all resulting by natural process from the normal components of the air, may appear and disappear, but the detection and measurement of them has yielded, thus far, data too meager to permit of generalization. Sulphureted hydrogen, sulphurous acid, hydrochloric acid, and hydrocarbon gases may pass into the air by natural processes, or escape from the chimneys of factories, but they are either destroyed by chemical action or washed down to the earth again by rain.

With regard to carbonic acid, however, the case is different. Being much more soluble in water than either oxygen or nitrogen, and being required in enormous quantities to supply the vegetation of the world, it might be expected to vary in its proportion in different parts of the world, at different altitudes, or with other changes of condition. But the fact of its constancy in proportion, so far as earlier methods could demonstrate it, was known almost as soon as its part in the economy of nature was understood; and the possibility of its variation even within very narrow limits is a question which has been left for the present generation of chemists to decide. It is interesting to note, however, the gradual improvement which has been made in dealing with the small proportions which this gas represents in the air. For many years chemistry was content with the statement that it represented from 4 to 6 parts by volume in 10,000 of air; many works on chemistry still give 4 parts in 10,000, but there is the best reason for believing, at present, that the average proportion is slightly below 3 parts in 10,000 all the world over.

From a number of European observers has come during ten years past a mass of information upon the question of carbonic acid in the air, which at present may be said to well nigh exhaust the subject. Angus Smith found in the air over the moors of Scotland 3·36 parts in 10,000 by volume; Farsky found 3·43 as the mean of 295 observations; Henneberg, 3·20; Hasselbarth and Fittbogen, 3 24 in Germany for inland districts, and 2·92 near the sea coast. Reissler found 3·035 as the mean of a year's observation in Switzerland, 420 meters above the level of the sea; and Muntz and Aubin, on the top of the Pic du Midi, in France, 2,877 meters above the sea, 2·86 as an average of 14 determinations.

To the observers Muntz and Aubin, and to Reiset, we

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owe the most recent and satisfactory results upon this subject. Working by different methods, each apparently faultless in its details, and carefully tested as to its sources of error before using, the substantial agreement of their results is the best guarantee of the accuracy of their work. Reiset finds 2·962 as the average number of volumes in 10,000 of air, Muntz and Aubin, 2·84. Both agree as to the fact that the air of cities is appreciably richer in carbonic acid than that of the country. Muntz and Aubin find 3·19 for Paris as an average of many determinations; Reiset finds 3·516 as the highest and 2·913 the lowest. The lowest proportion ever found by Reiset was 2·779 in the midst of a field of barley and lucerne far from the city, and therefore under conditions where, presumably, the absorption of carbonic acid from the air would be most rapid. As to the air of cities and towns, Schulze had previously shown that the air of narrow courts and alleys contained much higher proportions of carbonic acid than that of open places.

Carbonic acid is most abundant during fogs and generally during still and cloudy weather, while clear days indicate a decrease in its proportion. Rain, however, seems also to lessen it. During the day there is less than at night. Altitude of places seems to have little effect upon the quantity of carbonic acid when other conditions are constant. The influence of vegetation in decreasing the proportion is less than might be expected, and the predominance of carbonic acid in the air of cities is to be ascribed mainly to the use of fires, decreasing and increasing with the seasons as the consumption of fuel varies.

To show the influence of animal respiration, Reiset mentions that on one occasion the proportion of carbonic acid was sensibly increased by the proximity of a flock of 350 sheep, while his apparatus was in use.

In all of the above cases of variation in the proportion of carbonic acid with changing conditions, it is to be remembered that the variations are exceedingly small, never reaching 1 part in 10,000 between the extremes. The entire range for all outdoor places tested in these experiments was between about 2·8 and 3·5 volumes in 10,000 of air.

In order to find whether carbonic acid is uniformly diffused in the air throughout the world, Muntz and Aubin prepared a number of tubes for absorption of carbonic acid from the air, and put them into the hands of members of the different expeditions sent out to observe the recent transit of Venus. The tubes were sealed until opened at the appropriate stations, and after passing the proper volume of air the observers sealed them again and returned them to the above chemists at Paris. From an examination of these tubes the carbonic acid in the air of the distant station was determined, and in this way new data were obtained from widely separated points in many parts of the world. The results, as recently published, are as follows:

The general average of all the stations shows 2·78 volumes of carbonic acid in 10,000. The average for France, as given above, was 2·84. The highest results in the series were never higher than the highest observed in Europe, while the lowest results are less than the lowest of the latter. The average for the northern hemisphere is 2·82, almost that of France, while the average for the southern hemisphere is notably lower, viz., 2·71. The latter result has led to a re-examination of the air of the southern hemisphere through the aid of a resident observer at Cape Horn, and the examination, should it confirm the above figures, will indicate some agency peculiar to this hemisphere in lessening the proportion of carbonic acid. Muntz and Aubin account for such a result by reason of the lower average temperature of the southern hemisphere, owing to which, in accordance with the hypothesis of Schloesing, the absorption of carbonic acid by the water of the ocean and its fixation as calcium bicarbonate (bicarbonate of lime) would be more active.

As to the sources of the carbonic acid in the air, Dumas holds that physiological processes can have little to do with its increase, and that volcanic agencies are the principal sources. The gas is known to escape in abundance from volcanic craters and from fissures in volcanic regions. The reports of recent volcanic disturbances in Java and adjacent islands are accompanied by accounts of suffocation of men and animals by carbonic acid from such sources. It is liberated in abundance by the action of heat upon limestone and other carbonates, and also by the spontaneous decomposition of solutions of bicarbonate of lime, such as are often found in nature. The abundant deposits of limestone in the crust of the earth form, therefore, an inexhaustible source of the gas under certain conditions, and their abundance, together with that of mineral coal, points probably to a period in the earth's history when a much higher proportion of carbonic acid was present in the air.

While all evidence goes to show, therefore, that carbonic acid is at present an almost invariable constituent of the air, it is one which requires least change in the physical conditions under which the earth exists to effect a change in its proportion. Minute as the proportion is, the delicacy of its relation to animal and vegetable life on the earth makes the maintenance of the apparently unstable equilibrium a matter of serious concern to mankind.

VIRGINIA is making flour of peanuts, of which she raises 2.0 0,000 bushels this year. Peanuts, so called in the Old Dominion, were introduced from Africa, and are known in North Carolina as ground peas, in Tennessee as goobars, and in Georgia, Alabama, and Mississippi as pinders.

THE OSCILLATIONS OF THE SEA.

In a note of mine published in No. 10 of the *Revista Scientifico Industriale*, I spoke of the work of Mr. G. H. Darwin entitled "The Stress Caused, etc." In this note I said that the author, with others, had reached the conclusion that the tension produced by the weight of the continents and mountains was not adequate to cause terrestrial elevations and depressions. This conclusion at first seems contradicted by the fact of the continual oscillation of the earth's crust, the actual emergence and immersion of the continents, but in fact it is not. Adhemar and Croll have given an explanation of continental movements upon the hypothesis that, by the procession of the equinoxes, the motion of the terrestrial perihelion, and the eccentricity of the earth's orbit there was accumulated alternately at the poles enormous masses of ice. This ice once deposited displaced the center of gravity of the earth and produced a movement in the oceans, the water always flowing toward the center of gravity, hence the submergences. To-day this view has become modified, but the conclusion remains unaffected.

According to the law of gravitation, all substances attract in proportion to their mass. A continent hence exerting an attractive influence upon a surrounding sea produces an elevation of its level along the coast line and sustains the water at a height proportional to the mass of the attracting region. This result was deduced by Fischer reasoning upon the observations made with a pendulum, and Listing and Bruns reached an analogous conclusion. This of course destroys the assumption that the sea has a level surface. Moreover, the ocean is more or less high along the same line of sea board, according to the variable mass of the same from point to point. Thus Dr. Penk explained in this way many local phenomena of elevation and debasement especially conspicuous during the glacial period. He said if a region can attract the sea in proportion to its mass, whatever increases that mass increases the effect; and an accumulation of ice will bring about a raising of the sea level. I say that these views will not invalidate the conclusions of Adhemar and Croll, but in fact substitute for the displacement of the center of gravity another force, *i. e.*, surface attraction, the disturbance of the ocean remaining as before. The objection is made to the theory of the movement of the sea produced by the alternating accumulation at the poles of ice that in fact there is no difference in temperature between the north and south hemisphere. I doubt it. To decide whether the two hemispheres vary in heat, observations should be made over a century and over the whole superficies of the land. It is certain that for many thousand years this difference, assuming it, will decrease with the decreasing eccentricity of the earth's orbit. Should to-day or in the future no difference in temperature be established, it certainly obtained when the eccentricity was much greater, hence the conclusions of Adhemar and Croll as to the displacement of the sea can always stand. In the future, whether by increase of cold, or by decrease in eccentricity, the marine oscillations, from the accumulations of ice at the poles, should become less, and at length insensible.

Passing from the general question to a particular phase of it, we can extend the conclusions of Dr. Penk, saying, not only does the addition of ice over a region raise the sea level about it, but also the addition of any other body. In Italy we have two local facts of elevation and debasement, the oscillations of the sea level around the columns of the temple of Serapis, and the lowering of the plain of Venice. The first can be explained by Vesuvius, the second by the Venetian streams. Vesuvius, emptying the caverns that certainly exist in that region, attracts less, and the sea falls, and the columns of the temple of the Serapis emerge. If on the other hand by successive eruptions the mountain mass is enlarged, the surrounding sea rises, and the columns again become the home of a new generation of boring mollusks. The Po, Adige, Brenta, Piane, Tagliamento, all discharge their muddy streams around Venice. The sea by the invasion of the torrents retires, but upon the augmentation of the mass of the shore it raises the level and the plain of Venice seems lowered. The elevation of the sea causes the alterations noticed in the region, and the streams to be able to push their water into the sea at its higher level must raise their beds, which is helped by the protrusion of their mouths forward, and by the greater influence of the rising of the sea.—*Professor Zona, in Revista Scientifico Industriale.*

The Approaching Comet.

On September 3, Prof. W. R. Brooks discovered a faint nebulosity which rapidly increased in brilliancy, and which subsequent observations proved to be an approaching comet. It is now quite certain that the stranger is the comet originally discovered by Pons, at Marseilles, July 20, 1812, when its period was determined to be about seventy and one-half years. At that time it was a moderately bright object, clearly to be seen by the naked eye, and having a tail one or two degrees long.

During the present visit it will not be visible, in all probability, without a glass until the latter part of next January. But calculations concerning its greatest brightness cannot as yet be made; as during the past month it has behaved very erratically, increasing to many times its first luminosity. According to calculations made by Prof. S. C. Chandler, Jr., the position of the comet on the 10th inst. will be, right ascension 16 hours 33 minutes and 44 seconds; and declination 56° 51′ north. On the 26th inst. right ascension 16 hours 55 minutes 6 seconds, and declination 53° 40′ north.

United States Life Saving Service.

The report of the operations of this service for the year ending June 30, 1882, contains much information of general interest, and above that the scope of the work, whether viewed from a humane or a financial point of view, is much greater than commonly supposed. The present system dates from November 1, 1871, although the life saving service was organized in conformity to an act of Congress approved June 18, 1878. At present it faithfully watches the greater part of our coast, and is ever on the alert to render assistance to vessels in danger. It is founded on the grand principle of neighborly kindness, and its efforts are put forth to aid those of any nationality.

At the date of the report there were 189 stations distributed as follows: Coast of Maine and New Hampshire, 7; Massachusetts, 15; Rhode Island and Long Island, 37; New Jersey, 40; Cape Henlopen to Cape Charles, 11; Cape Henry to Cape Hatteras, 24; Florida, 5; Gulf Coast, 5; Lake Erie and Ontario, 10; Lakes Huron and Superior, 12; Lakes Michigan, 16; Pacific Coast, 7. Of the above 144 were on the Atlantic, 37 were on the Lakes, 7 on the Pacific, and 1 was at the falls of the Ohio, Louisville, Ky. On the coast of Florida surfmen were not employed at the stations, as the character of the coast for the most part makes escape from stranded vessels comparatively easy, the main danger to shipwrecked persons being of dying from hunger and thirst, as the region is but thinly settled. The keepers are in charge of houses of refuge, and are required to search the coast in both directions after every storm.

During the year there were 287 disasters to vessels, and of the 2,258 persons on board all were saved but 12. The estimated value of the vessels and cargoes was $4,758,357, of which $3,099,987 was saved. There were 67 vessels totally lost. In addition to this there were disasters to 58 smaller craft, as sail boats, row boats, etc., on which were 128 persons, all of whom were saved. The results of all the disasters coming within reach of the service were as follows:

Total number of disasters	345
Total value of property involved	$4,766,227
Total value of property saved	$3,106,457
Total value of property lost	$1,659,770
Total number of persons involved	2,398
Total number of persons saved	2,386
Total number of persons lost	12
Total number of shipwrecked persons succored at stations	468
Total number of days' succor afforded	1,379
Number of vessels totally lost	67

To the above list should be added the rescue of 29 persons who had fallen from wharves and piers and who would certainly have drowned but for the assistance of the life saving crews.

Of the disasters, 198 occurred on the Atlantic and Gulf coasts, involving the lives of 1,225 persons, all but 10 of whom were saved, and property (vessels and cargoes) to the amount of $2,676,132, 140 of the disasters were on the Lake coasts, and the people imperiled numbered 1,082, of whom 2 were lost, and the property involved was $1,722,720; on the Pacific coast there were 7 disasters, risking 91 lives, and $367,375 worth of property. During the year the surf boat was used 284 times, making 381 trips, and landing 327 persons; the self-righting and self-bailing life boat was used 11 times, making 15 trips and landing 27 persons; smaller boats were used 98 times, making 121 trips, and landing 43 persons; the river life skiffs were used 30 times, making 111 trips and landing 124 persons; the breeches buoy was used 17 times, making 170 passages, and landing 158 persons. Five persons were rescued by surfmen swimming out to them; 10 more were saved by casting lines over vessels. In one case a disabled man lying at the foot of a cliff 780 feet high was rescued by one of the life saving party who was lowered down the cliff at the end of a line, by means of which both men were drawn to the summit.

Since November 1, 1871, there have been 1,692 disasters involving 14,702 persons, of whom 407 were lost, and $29,278,714 worth of property, of which $11,213,362 worth was lost. The total expenditures for the Life Saving Service for the year were $506,239.55.

A Fast Steamer.

The steamship Alaska, of the Guion Line, arrived in New York, September 23, from Queenstown, 6 days 21 hours and 40 minutes, surpassing her former record by more than 2 hours. Her 24-hour runs varied from 310 to 436 miles, her speed at some times, as shown by the log, being 18⅛ knots per hour. The Alaska has also made the fastest easterly trip from Sandy Hook to Queenstown, covering the distance in 6 days 18 hours and 37 minutes; the faster time easterly being due to the favorable current of the Gulf Stream. Other fast trips westerly were made by the City of Rome, of the Anchor Line, in 7 days and 2 hours; the Servia, of the Cunard Line, in 7 days 3 hours; the Britannic, of the White Star Line, in 7 days 7 hours and 11 minutes; the Arizona, of the Guion Line, in 7 days 8 hours and 34 minutes; the Fulda, of the North German Lloyd Line, from Southampton to New York, in 7 days 21 hours and 5 minutes; the Werra, of the same line, in 7 days 23 hours.

A CONSIGNMENT of very lively leeches was among the first day's receipts at the General Post Office in London on the inauguration of the new parcels post. The box containing them was a very slight one, and becoming fractured in transit, the contents escaped, and traversed the establishment in search of a promising "subject."

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John C. Trautwine.

This eminent engineer, after a long and eventful career, died in Philadelphia in his seventy-fourth year on Friday, Sept. 14. He was born in that city March 30, 1810. After receiving an ordinary education he entered the office of William Strickland, and was engaged on the Delaware Breakwater. Later he was employed on the construction of the Philadelphia, Wilmington, and Baltimore, and the Hiawassee railroads. In 1844 he began a five years' engagement on the Canal del Dique, in New Granada. In 1849 he was engaged on the Panama Railroad as chief engineer, and later he made a survey for the Atrato Interoceanic Canal, and in 1857 he surveyed the route for the Honduras Interoceanic Railway, a line that was never built.

He is and will be best known, however, by his writings, which have run through several editions. His book on "Railroad Curves" is the simplest and clearest book on the subject in the English language. He also wrote a book on "A New Method of Calculating the Cubic Contents of Excavations and Embankments by the aid of Diagrams." The work, however, on which his reputation will chiefly rest is his "Civil Engineer's Pocket Book." It is a monument to his industry and versatility, and is perhaps the best single treatise on civil engineering thus far published. Owing to the time when Mr. Trautwine studied and learned engineering, his book was, even at the time of its publication, somewhat behind the times. It has fallen still further behind now, but it would be difficult to find any other one book which alone would be as useful to a young student of civil engineering as this.

While engaged in work in tropical countries Mr. Trautwine contracted one of the malignant fevers so prevalent in those climates, from the effects of which he never recovered entirely, and which finally caused his death.

He was a prominent member of several scientific societies. He leaves two sons, William Trautwine, a conveyancer, and John C. Trautwine, Jr., who has been engaged with his father in his book work.—*Railroad Gazette.*

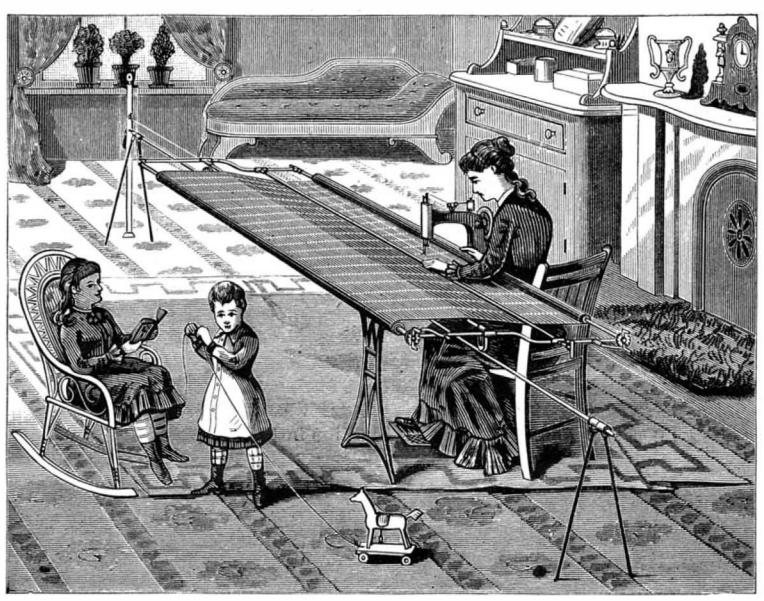
Old Steel Pens.

Says the New York *Sun:* "Pens are made of the very finest steel, and can be remelted and used again for many purposes. They can be turned into watch springs and knife blades, and can be dissolved and made available in the manufacture of ink. The suggestion is made that the children of the poor should be taught to collect cast-away pens, and thereby save valuable material and earn money."

The steel from which steel pens are made is so thin that it can be torn like stiff paper. It goes through such tormenting processes in the rolling, cutting, pressing, slitting, and forming, that it is a wonder that enough of energy is left in to stand the bath of fire, water, and the subsequent heat of the annealing furnace to have any of the original life of the steel left in it. And, in fact, there is little of the *vivre* of the original metal left when the steel pen has done its brief duty. It would be much more sensible to gather up the oxidized scales from about the smith's anvil for making into "watch springs and knife blades" than to collect rejected steel pens for these purposes.

IMPROVED QUILTING FRAME.

The Davis quilting frame is the subject of a patent issued February 6, 1883, to H. T. Davis. It is intended as a convenient substitute for the old-fashioned, cumbersome quilting bars, which required an entire room, necessitated the gathering of the feminine neighborhood, or encumbered the house for a week. Mr. Davis' invention permits the use of any sewing machine, and by its means a quilt or a comfortable may be finished by one operator in two or three hours. The bars of the frame are of brass pipe or of iron pipe japanned or bronzed; the frame stands on two light legs, and may be retracted or expanded at will, and when not in use it may be stowed away, occupying but little space. The entire frame weighs but little over sixteen pounds, and, as seen in the engraving, it occupies but a small portion of the room. It is adapted not only for large articles, as coverlets, but also for cloaks, linings, skirts, and children's hoods—any article that requires stretching on a frame for quilting. These frames are made by the Davis Quilting Frame Company, 320 and 322 Broadway, New York city. Address as above for further information. See advertisement on another page.



DAVIS' IMPROVED QUILTING FRAME

Another Electrical Boat.

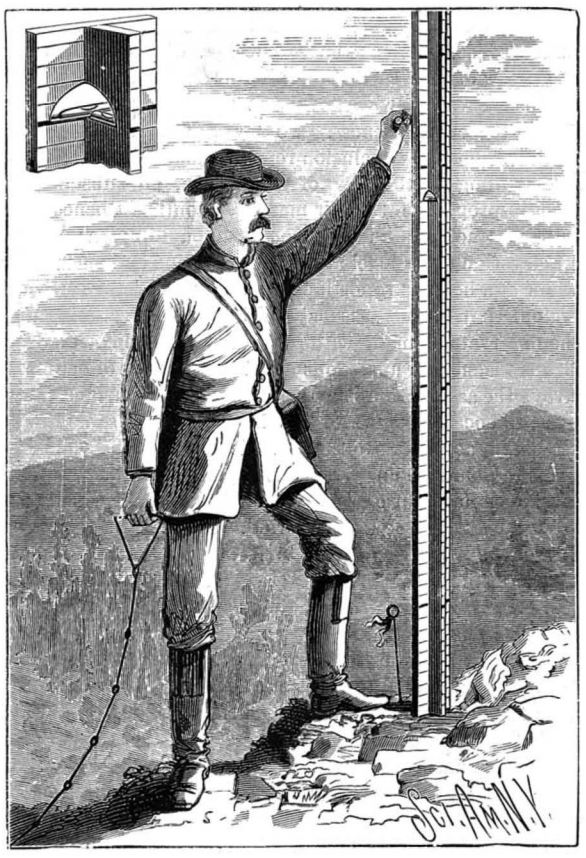
The *Moniteur Industriel* gives an account of the trial of an electric boat at Geneva on July 22. It was constructed by Messrs. Meuron & Cuénod, and was 20 feet long by 14 feet beam. The boat was driven for several hours at a speed of from 5½ to 6½ miles per hour, by three bichromate batteries of six cells each. The motor—which was on the Thury system—acted directly on a small two-bladed screw, there being no intermediate gearing.

THERE are in New York city 824 miles of gas pipes, 486 miles of water pipes, 391 miles of sewer pipes, 14½ miles of steam supply pipes, and 15 miles of underground electric wires.

SURVEYOR'S LEVELING ROD.

In this invention it has been the aim of the patentee to make the use of the telescope unnecessary by placing the rod in a vertical position, as compared with as many horizontal planes as there are divisions in the rod. The rod consists of a board marked with the usual graduations, and to its center is attached another board with its plane at right angles to the first. A cross section of the rod would be shaped like a T. The outer edge of the second board is graduated to correspond with the first.

In an opening in the first board is placed a small bulb level, and in a similar opening in the second board is another



SURVEYOR'S LEVELING ROD.

level. These levels are in the same horizontal plane, but at right angles to each other, and at such a height as to be conveniently watched by the rodman. To the back of the first board is attached a handle by which the rod is held in position. When the rod is in an exact vertical position, as shown by the small levels, elevations can be made at sight in explorations, or by the aid of a spy-glass or telescope without the use of a reticule, for the reason that the division on the edge of the second or central board, which is in the same horizontal plane as the observer's eye, will coincide with a division on the other board, the two uniting to form a continuous line, thus doing away with the horizontal line in the reticule. All of the remaining divisions will form broken lines.

The rod is light and convenient, may be made in two or more pieces to obtain the desired length, and may be graduated by any system. With this rod the level can be modified by removing the leveling attachments and reticule, a horizontal and vertical movement being sufficient.

The rod has been patented by Dr. Jesus Muñoz Tébar, of Carácas, Venezuela.

Imitation Amber.

Roessler's recipe is to melt one part of rosin (colophonium), then add two parts, by weight, of shellac. When the mixture becomes sufficiently fluid one part of white rosin, that should be clear as water, is then added.

English Railways.

At a recent meeting of the American Society of Civil Engineers, a discussion by Mr. Charles Douglas Fox, of London, Corresponding Member of the Society, "On the Increased Efficiency of Railways," was read by the Secretary. Mr. Fox referred to the fact that English railway managers and engineers have long realized the great importance and economy of a thoroughly substantial road bed. The formation widths on their chief railways are now made 30 feet, both in cuttings and on embankments for the double lines, and very great care is taken to thoroughly drain this formation in cuttings by deep ditches on each side with earthenware drain pipes in them, and fill in with broken stone or other dry material. The ballast, consisting of broken stone, clean gravel, coarse sand, burnt clay, or ashes, is not allowed to be less than one foot in thickness below the bottom of the tie. For lines of constant and heavy traffic, the bullhead grade, double headed rail, having a large top member for wear, and a very small bottom member, is found to be the best section for steel rails. The weight of these rails is 84 pounds per yard. The chairs are from 40 to 46 pounds each, and the rails are secured in them by keys of compressed oak. The tendency of the English companies is to expedite traffic, both passenger and goods, not by higher rates of speed, but by reducing the number of stoppages.

The traffic lines are gradually quadruplicating their tracks—in some cases throughout, in others by sidings seven miles in length. There is a very general feeling in England in favor of identifying the driver with his engine, and holding him responsible for its working. On some lines the name of the driver is conspicuously attached to the engine. Mr. Fox forwarded also the railway regulations of the English Board of Trade, which give very minute directions in reference to the construction and running of railways.

Progress of Sorghum Sugar Manufacture.

The new Kansas Sugar Refining Company, located at Hutchinson, Kan., turned out its first batch of sugar on the 12th of September. This company has invested $125,000 in works here, and proposes making its headquarters at Hutchinson, while they will establish branch mills over the State and ship the product here for refining. The results of to-day settle all controversy about the possibility of making sugar from sorghum cane. The run to-day was a bright grade, and crystallized perfectly without the sorghum taste. The mill will be run from this on at a full capacity, which is over one hundred barrels per day of sirup. This season's product will aggregate 9,000 barrels of sugar and 7,000 barrels of sirup. All grades of white sugar will be made, but the machinery for granulating is not up yet. To run this mammoth establishment requires two hundred men day and night. The Cleveland *Leader* says the works at Hutchinson and at Sterling are both operated on the same principle, and both have met with the same successful result. Hutchinson and Sterling will soon be able to supply Kansas with her sugar.

Artificial Nourishment.

Some of our foreign exchanges relate a novel method for administering nourishment to invalids and persons with weak digestion which, it is alleged, has been practiced in Paris with great success. Diseases and enfeebled health commonly owe their origin to the imperfect assimilation of food. When the digestive functions are impaired the body is insufficiently nourished, and is unable to resist the encroachments of disease. For the maintenance of health and for restoration in sickness it is of the first importance that the food be not only of the most nourishing kind, but that it be administered in a form easy of digestion and assimilation. In a paper recently communicated to the Medical Hospital Association of Paris by Dr. Debove, he describes a form of alimentation which has attracted much attention. His system is to apply nourishment in form of powder instead of in bulk. Uncooked meat, from which the fat has been removed, is minced finely and allowed to dry in an oven at about 90° Centigrade until it becomes perfectly hard without being burnt. It is then reduced to impalpable powder by pounding in a mortar and passing through a fine sieve. The powder so obtained represents about four times its weight in flesh. The fiber and the large percentage of water contained in flesh are thus removed, and the essential properties of the meat retained and presented in a form the least difficult to digest. Other alimentary substances, such as lentils, beans, peas, etc., can be prepared in the same way.

In cases of consumption the treatment is said to have proved marvelously successful, and in general debility and nervous disorders, arising from weakness, restoration is rapid and permanent. A few spoonfuls of the powder are equal to the meal of a person with a healthy appetite. The powder, when bottled, will keep an indefinite time, and may be taken with a little milk, gravy, wine, water, or other liquid.

GALVANIZED iron pails for drinking water should not be used. The zinc coating is readily acted upon by water, forming a poisonous oxide of zinc.

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Philadelphia International Electrical Exhibition.

An international exhibition of electrical appliances will be opened in Philadelphia on September 2, 1884, under the auspices of the Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts. The project has been recognized by Congress, which passed an act, approved by the President, providing for the admission, duty free, into the United States of all articles for exhibition only. Judging from the success that has attended similar exhibitions in Europe, the fact that it is the first of the kind held in America, the high position occupied by American electricians, and the eminent reputation of the institution having the matter in charge, the project will have a prosperous issue. Any information concerning it can be obtained by addressing the Secretary, Franklin Institute, Philadelphia, U. S. A.

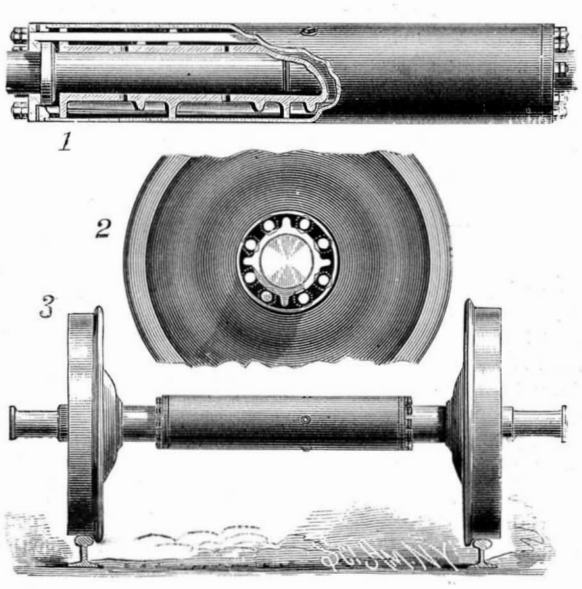
How Cholera is Bred and Spread.

In a communication to the London *Daily News* Dr. William B. Carpenter suggests that Professor Tyndall's doctrine that cholera germs are bred in the human intestines, and from them by means of excrement are diffused, does not go far enough in assuming by implication that the human intestines are the only breeding place of cholera germs. Dr. Carpenter gives three remarkable instances as evidence that cholera, or at least the almost equally fatal choleraic diarrhœa, was caused by offensive piggeries, by a retarded drain in marshy ground, and by a compost heap of unnamable filth in an unused yard. The outbreak of fatal disease in each of these cases was directly traced to these sources, the effluvium being borne on the wind. In each the disease was successfully combated and finally conquered by a removal of the filthy cause.

CAR AXLE.

By this invention the sliding of the wheels upon the rails of steam and horse railroads, and the consequent strain, wear, and loss of power are prevented. The axle is of either steel or iron, and is made in two parts, the wheels being attached in the ordinary way. The two parts of the axle are placed in line with and abut against each other, and have collars formed upon them near the wheels, as shown at the left in Fig. 1. Upon the adjacent parts of the axle and between the collars is fitted a cast steel or iron sleeve, formed with flanges around its ends, intermediate points, and center, and with four ribs upon its outer surface, extending from the center flange to the end flanges. Upon the flanges is shrunk a wrought iron sleeve, the ends of which project a little beyond the ends of the inner sleeve, so as to overlap the collars. Steel rings, rabbeted to receive the ends of the wrought iron sleeve, and of a diameter sufficient to allow the collar to pass, are placed at each end. Upon the axle at the outer sides of the collars are steel rings, made in two parts, and between these rings and the rings on the wrought iron sleeve are inserted a number of thin sheet metal washers, by the removal of one or more of which the end wear of the parts can be taken up.

The parts are held together by long bolts which pass through holes in the outer steel rings and through recesses in the flanges of the inner sleeve. In the outer sleeve are a number of openings, closed by screw plugs, some one of which will always be upward when the axle is at rest, to allow oil to be readily poured into the space between the



MEEHAN'S CAR AXLE.

sleeves. As the axle revolves, the ribs on the inner sleeve, and the long bolts, raise the oil which passes through the bolt recesses in the flanges to the space at the ends of the inner sleeve, where it comes in contact with the axle and collars. The oil also passes through openings in the inner sleeve and along longitudinal grooves in the inner surface of the sleeve, so that the entire frictional surface of the axle is kept lubricated. From the above description and the engravings it will be seen that either wheel with its connected part of the axle can move independently of the other, and by reason of the long bearing surface thus secured, no appreciable wear of the parts is possible.

This invention has been patented by Mr. Thomas Meehan, of 27 Park Row, New York.

SAFETY STOP FOR ELEVATORS.

Considerable ingenuity has been displayed in devising means of arresting elevator cars in case of accident to the hoisting rope or machinery, but in spite of that many accidents have occurred for want of a really efficient stop.

We give an engraving of an improved safety stop for elevators recently patented by Mr. William Whitely, of Housatonic, Mass., which is very simple and at the same time seems to embody the elements of success.

The elevator car is guided by tongues on the vertical beams in the elevator well in the usual way, and is supported by a wire rope secured in its sleeve, A, projecting

WHITELY'S SAFETY STOP FOR ELEVATORS.

through the top of the car and fastened by two nuts, one above and the other below the top of the car. This arrangement of the sleeve and nuts admits of regulating the tension of the rope, by adjusting the nuts surrounding the car; there is a frame consisting of a crossbar, B, side pieces, C, and a crossbar, D, connecting the side pieces under the car. This frame is connected by a rope with the weight, E, which nearly counterbalances the frame and supports it partly above the elevator car. In grooves in the side pieces, C, are pivoted cams, F, connected by links with bolts extending downward through the car top, and fitted with rubber springs to relieve the shock of stopping the car. So long as the hoisting rope and machinery act normally, the frame and its cams will move with the car; but should the hoisting apparatus give way, the car falling faster than the frame brings the cams, F, to bear against the timbers at the sides of the well with sufficient pressure to arrest the car and prevent further accident.

A Remarkable Ice Well.

BY H. C. HOVEY.

A remarkable well exists on the premises of Mr. Levi Allen, at Horse Plains, Missoula County, Montana. This well was dug to supply a steam saw mill, situated on low grounds, distance three-quarters of a mile from the Pond Orelle River, in what seems to have formerly been the bed of the stream, although the ground is now solid and firm. At the depth of 35 feet a strong current of air was encountered, sufficiently strong to extinguish a common lamp or candle. The digging was continued to the depth of 45 feet, and then a steam pump was fixed reaching to within 15 feet of the bottom of the well.

Last September the well began to freeze up, and as it was important to keep it from doing so, Mr. Allen had it thoroughly banked with saw dust. The process, however, went on until by the last of November it was frozen solid. The mill has now been idle for several months. About the 1st of July the proprietor went down to see the condition of things, and found "two feet of solid ice in four feet of pump!" He would like an explanation of this surprising state of things, and to know what can be done to make his well serviceable.

The latter inquiry cannot be properly answered without a more exact knowledge of the locality. Quite possibly a new well sunk a few feet from the first one might be free from ice. Plainly the strong current of air comes from some hidden cavity of large size. In exploring caverns it is invariably found that when a strong draught is observable through a narrow aperture, it indicates the proximity of some large chamber. A new well, by escaping the aperture, would be exempt from the cause producing the ice.

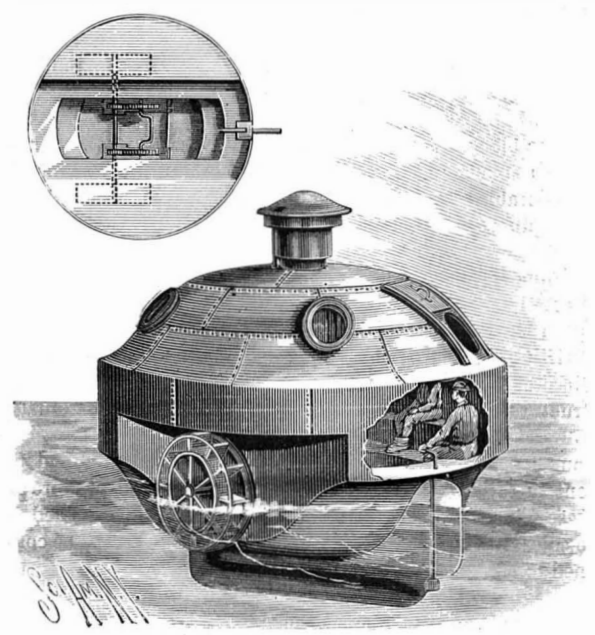
The phenomenon is not unprecedented by any means, although not very frequently observed in this country. Ice wells have been found in Vermont and New York, and their peculiarities described by Silliman and Hitchcock. An ice cave may be seen at Decorah, in Iowa, which is fully described in White's Geological Report (vol. i, p. 80). The ice caves of France and Switzerland are numerous, and an account of them has been published by Rev. G. F. Browne From an ice cave on the Peak of Teneriffe a great ice supply is annually obtained for ships; which, being columnar in structure, melts less readily than the ordinary sort, and is therefore especially suitable for transportation. One of the largest of these natural ice houses is in the Carpathian Mountains, near the village of Stelitze, and is resorted to in midsummer to supply the wants of the villagers. At that season the roof is covered with icicles, and the drops falling to the sandy floor are instantly congealed. On the approach of winter the icy mass is said to begin to dissolve; and by Christmas it is gone, leaving the cavern warm and dry till spring returns, when the ice forms anew! Ice has also been known to form in very deep mines, for instance in the Imperial salt mines at Iletski, in the Ural Mountains. Here there is a series of natural hollows in the gypsum, where, when the weather is hottest, the ice hangs in solid masses, that melt away again amid the rigors of a Russian winter.

Several different theories have been brought to explain this class of phenomena. It has been suggested as a cause that nitrous earth dissolved by flowing water makes a freezing mixture; that waves of cold set in motion in winter fail to penetrate the crust of the earth till the next summer, and that warm waves are likwise retarded until the following winter; that the heavy cold air sinks into subterranean recesses, whence the light and warm air fails to dislodge it; and that currents of air, blowing through caverns, produce intense cold by the simple process of evaporation. This latter theory looks the most plausible, and would readily account for the frozen well of Montana.

Still another theory, however, may be mentioned—that suggested by Prof. Lowe, in a paper read before the Boston Scientific Society, in 1879. His theory, suggested by the action of what is known as the Frizzel air compressor, is, in brief, that bubbles of air drawn into water flowing down through fissures in the rock are liable to a continually increasing pressure, compelling it to part with latent caloric, which it immediately absorbs from the water on being liberated in any cave or well or mine. This process may sometimes be sufficiently active to reduce the water to a frozen condition, from which it would be relieved whenever the flow was arrested by surface freezing, drought, or any other cause. Possibly there may be two or more of these conditions in combination in Mr. Allen's well, making the water in it remain unaffected by common climatic changes. It is to be hoped that he may continue his interesting observations, and report them from time through these columns.

LIFE BOAT.

The hull of the boat herewith illustrated is preferably made of sheet iron, and in its characteristics differs much from the common boat. The horizontal sections are circular, with the exception of a segment, which is cut away from each of the two sides to admit the paddle wheels. The sides of the boat next to the wheels are vertical, and the floor of the boat over each wheel serves as a seat or storage room inside. A cut water, a keel, a stern post, and a rudder are formed outside of the circular contour. The hull of the boat is provided with sides forming a vertical cylinder, and with a nearly spherical roof joining the upper edge of the cylinder. Around the roof are sealed lights, and in the center is a cupola perforated for ventilating the interior. At one side of the roof is a sliding door, for entrance and exit, which is made water tight by packing. The interior is



HAMILTON'S LIFE BOAT.

provided with seats, and straps and buckles are secured to the wall to draw over the bodies of occupants to sustain them in very rough weather, and loops are placed below the seats for the passengers to thrust their feet into. The paddle wheels are attached to short shafts provided with pinions into which engage spur gears mounted on a crank shaft revolving in bearings secured to the boat, the crank extending across the hull in a location to be conveniently worked by the occupants. This boat may be carried by ships and used to escape from them in case of accident. A large number of persons with the necessary provisions may be carried in the roughest water without danger.

This invention has been patented by Mr. Tobias Hamilton, of Centrefield, Ohio.

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Intestinal Parasites in Domestic Fowls.

During the past year Dr. Thomas Taylor, microscopist of the Agricultural Department, has examined several sick domestic fowls to ascertain the cause of their ailment. The first examined was in a moribund condition when received, and died within an hour after it was brought to his division. Its comb was of a deep red color, abnormally so, the tips being somewhat black. On dissection, its general viscera presented nothing peculiar; but on removing those of the thorax and abdomen, the lungs excepted, he observed on the intercostal muscles, bordering on the ribs, what resembled a superficial reddish pigment in streaks, while small specks of various forms covered the lining of the abdominal cavity. These varied in size from the point of a pin to that of a small pin head. On removing a small portion of this colored matter, and viewing it under a suitable power of the microscope, he found it to consist of living mites (*acari*) in various stages of growth. He next removed a small portion of the lung tissue, and placing it under the microscope, here again discovered several living mites. Another portion was removed from the lungs, not exceeding half a grain in weight, when three more mites were discovered. These last were so lively that it was difficult to keep them long in view without changing the stage.

This mite closely resembles Cytoleichus sarcoptoides (Megnin). Athough this species has not hitherto been found in America, it is known in Europe and has been found in such habitats as above described, and Megnin states that it causes the death of wild and domestic fowls. He says that they are found in the air passages of the lungs, in the bronchial tubes and their divisions, in the bones with which the air sacs communicate, and in other cavities. They are also found in the bronchi of birds, and when they are extremely numerous, cause titillations of the bronchial mucous membrane, indicated by a slight cough, in some cases causing symptoms of asphyxia, and of congestion, to which the birds may succumb. He instances an example in the case of a pheasant which died of an unknown disease, and in which, when dissected, this obstruction of the bronchi was well manifested.

Dr. Taylor thinks it probable that these mites, after they have effected a lodgment in the lungs, bore through the pleura and invade the thoracic and abdominal cavities, where they breed in large numbers, producing great irritation and ultimately the death of the fowl.

About two months after the dissection of the first fowl in which he found the mites above described, a second fowl in a moribund condition was brought to him for examination by the same gentleman who brought the first. The comb of this fowl was also highly engorged with blood and the tips black. Its crop was greatly distended. It was unable to stand up, breathed with difficulty, yet exhibited considerable strength when about to be killed. It had been sickly during the previous four weeks. He took the precaution in this case first to remove the skin, so that he could examine the cellular tissue, when he observed great numbers of small white opaque specks of various dimensions, varying in size from the one-hundredth of an inch to the one-twelfth of an inch in diameter. When viewed under the microscope, the tissue showed within its folds and cell structure numerous mites, which proved on examination to be Laminosioptes gallinorum (Megnin). Further investigation showed that the opaque markings above alluded to contained, in many instances, the remains of one or more of these mites. The substance of the opaque specks seemed to be calcareous. The habitat of these mites seemed to be confined to the cellular tissue wholly. He examined the viscera and cavities of this fowl, but found neither living mites nor their remains or calcareous specks.

Megnin states that in Europe this acarus has been found in all turkey hens, and especially in foreign turkeys of the family Phasania.

He says that these acari gather in millions in the cellular tissue and destroy the fibers, but without causing any other change than the production of the calcareous concretions spoken of. He further says "They have been noticed in such numbers in old birds as to leave no doubt as to their being the cause of death." The existence of either of the mites above described in American fowls has not hitherto been known.

In this same fowl he found thousands of encysted nematoids, resembling, when viewed under a low power of the microscope, Trichina spiralis; but when removed from their watery cysts and viewed under a power of about 500 diameters, they seemed to be of an undescribed species. The male worm has on its posterior terminal point a bulbous body furnished with spines which distinguishes it from any other nematoid with which Dr. Taylor is acquainted. These encysted worms are wholly confined to the muscular coating of the stomach and intestines.

On examining a third fowl, which was dead when brought to him, he found in its cellular tissue numerous mites of the species gallinorum above described.

Dr. Taylor says from these examinations it seems probable that a considerable amount of disease prevailing among American fowls, and not referable to any known type, may be due to the presence of such parasites as he found in the cases above mentioned. Investigations in this direction, may, therefore, have an important bearing on the healthful raising of domestic fowls.

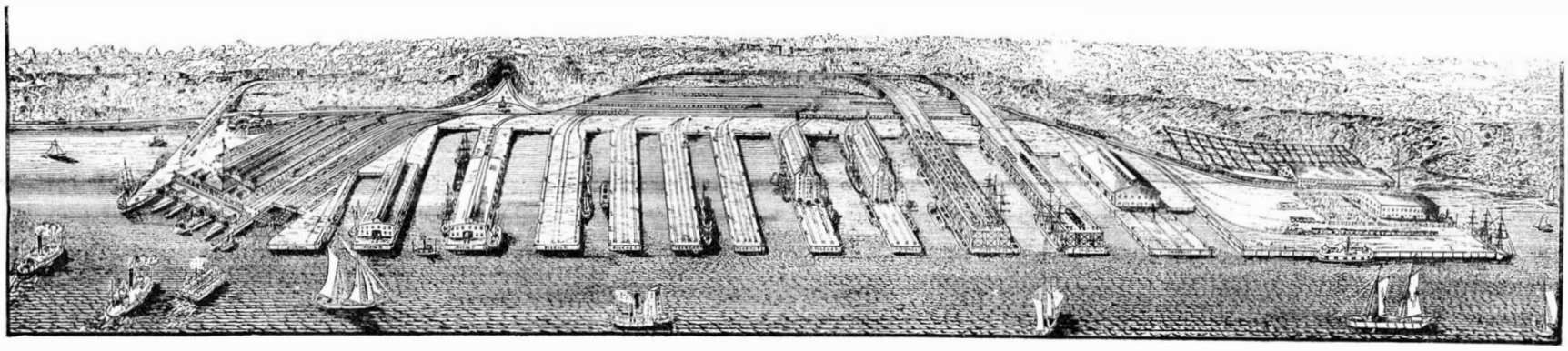
He suggests that carbolic acid, or other disinfectants, sprinkled in and about nests and on the floors of henneries, might prove useful as an antidote to parasites of the classes described, as well as to those which infest the exterior of the bodies of fowls.

NEW YORK TERMINUS OF THE N. Y., W. S. & B. R.

When planning the terminus at this end of the New York, West Shore, and Buffalo Railway, the officers anticipated an immense traffic in the future, and provided means for its rapid and easy handling. The location of the terminus being on the west shore of the Hudson River, just below the beginning of the high bluffs, and at a point not yet encroached upon by Jersey City and Hoboken, gave them access to an almost unlimited water front and permitted the erection of dock facilities which are unrivaled in this harbor, and are free from street and other obstructions. The road passes from the plains back of the river through a tunnel 3,985 ft. long, cut through solid trap rock, and sufficiently wide to admit of two tracks. The cuts forming the approaches to the tunnel have a combined length of 3,300 feet. As the road leaves this end of the tunnel, it divides into branches leading to the several docks.

To the extreme left of the drawing, or south, is the round house. Next to this are the ferry slips and railway passenger stations. Lines of boats will run from here to Forty-second Street, New York city, and also to a down-town point. Adjoining the ferries are the freight transfer slips, where loaded cars are run upon scows and towed across the river to their destination. Steamship docks and warehouses for the loading and unloading of the largest ocean vessels come next. Docks devoted to the local river and coast trade, and to lumber form the next division. On piers 8 and 9 will be built two grain elevators of great capacity, one of which is now being erected. Two coal transfer piers come next. The loaded cars will be run upon a trestle high enough to enable them to discharge their loads directly into vessels lying alongside. The tracks leading to these piers, after passing from the mouth of the tunnel, make a sharp turn and skirt along the base of the hill, gradually rising and finally turning again toward the river, going over the lower tracks on bridges to the piers. To the extreme right of the drawing are shown the completed stock yards and abattoir.

There are 275 acres devoted to the terminal, and 165 acres of upland suitable for building lots. An idea of the extent of the work may be formed from the fact that the water front measures 6,790 feet, and the front and sides of the docks measure 30,290 feet, or $5\frac{74}{100}$ miles. The terminal property is owned by the West Shore & Ontario Terminal Company, of which Mr. Walter Katté is chief engineer. The accompanying drawing is reproduced from a pen sketch by F. S. Cook, engineer in chief of the topographical department of the N. Y., W. S. & B. R. All the capital stock of the Terminal Company is owned and held in equal amounts by the West Shore and Ontario Railway Companies.



Soaps as a Vehicle for Medicine.

Pure soap alone is a valuable and convenient remedy for many affections of the skin, causing a softening and soothing influence pleasant to the feelings and the sight, besides exerting a healing effect in most cutaneous diseases; and from this softening property it causes any medicinal substance it properly contains to act more certainly, and with greater promptness, than perhaps any other vehicle that is at present known.

In adding a medicinal substance to soaps, some intelligence should be had to properly understand the character and compatibility of the several constituents of each, for there are many drugs that are not suited to mix with soap, that will not combine or are decomposed and changed by the alkali present in all soaps, and which is always present in slight excess, else it would not do proper duty as a soap; for though soaps are not truly soluble in water, yet their action in use causes an emulsion that has this softening action and pleasant effect, though it be washed away with more water, leaving scarce a trace of soap behind.

In making a medicated soap the first care should be to have the purest and cleanest fats or oils that can be obtained and also the best and purest alkali known, while great skill must be exercised in the making to insure a perfect combination, in fact, a thorough soap; and there are few ready made that can be recommended, as sophistication is now a common practice in the making of most all the soaps of commerce. Having such a soap, the best means of combining the remedy is by means of the mill, for it can be added without heat, while the perfume if used can be combined at the same time. All colors as a rule should be avoided, unless the drug will give an unpleasant one; then to please the eye a color can be used, but care must be taken to have an inert or harmless color, compatible with the medicine.

The best and more suitable soaps for medicinal purposes are undoubtedly those made from vegetable oils, such as olive, palm, and almond oils, though mutton tallow would make a very suitable soap combined with any of the oils named; and if cheapness is desired, a little resin will not injure its healing qualities, but in some cases might prove beneficial, as it enters into many healing salves in the pharmacopœia. In using palm oil it should be previously bleached as the natural color it contains is an objection; this oil is particularly applicable for medicated soaps, but as by itself it becomes too hard it is well to add a nut oil or cotton oil to give it plasticity.

It is impossible here to give all the formulas for the different medicated soaps, in fact, even give a list of the many substances that could be combined with soap to make such; yet I shall try and mention a few that I think are the most worthy. Thus for cosmetic purposes the juice of the lettuce and cucumber have a blanching effect on the skin, benzoin, tar, petrolatum, and carbolic acid give their healing properties to all soaps, and borax has a very softening influence. For disinfection, soap is a good vehicle for menthol and thymol, and other well known drugs, in fact, with suitable intelligence the manufacturer could make an endless variety of medicinal soaps, using the drugs in the proper proportion and making them all carefully. A mucilage of gum tragacanth added to all soaps for medicinal purposes causes much emollience, and exerts a great softness to the skin. In my technology of soaps details are given for most all the medicated soaps now known, and the proper proportions for manipulation.—*R. S. Cristiani, in Oil, Paint, and Drug Reporter.*

Pouchkoff's Modification of the Holtz Machine.

As well known, the fixed plate of the Holtz machine, as at present constructed, carries *externally* two paper armatures that are charged in order to prime the apparatus. Each of these armatures is fixed at the edge of an aperture through which one or several paper points act upon the movable disk.

In order to simplify the construction of the machine, and avoid the always delicate operation of making apertures in the plate, Mr. Pouchkoff, after gluing the armatures on the exterior of the latter, glues the points on the interior and connects the two by a horseshoe-shaped band of paper on the edge of the disk.

The machine thus constructed works, according to Mr. Pouchkoff, just as well as one of the ordinary kind.—*La Lumiere Electrique.*

Micro-organisms in Water.

Osmic acid possesses the property of hardening protoplasm, hence microscopists make use of it for detecting animalcula in water. According to L. Maggi, the chloride of palladium may be substituted for the more poisonous osmic acid, an acid more dangerous than prussic acid. By adding to the water a solution of palladium chloride (one in eight hundred) he obtained a precipitate in which the bacterial forms could be recognized under the microscope just as distinctly as in those obtained with osmic acid.—*Gazz. Chim.*

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Correspondence.

Storage of Wind and Wave Power.

To the Editor of the Scientific American:

I have read with interest several articles that have appeared from time to time in your valued paper relative to "storing power." In No. 10, vol. xlix., you say, "Let us hope for success and try again." This led me to put in my oar.

I understand the object of this discussion to be an interchange of views in order to bring out something tangible, something beneficial, and within reach of those desiring power, however great or small their requirements. All agree that power lost or allowed to go to waste, if properly and successfully stored, would turn every wheel between the oceans. To accomplish the object sought, some person or company of persons must provide for the storage of this power and sell to consumers for propelling machinery, ventilation, cooling, etc., as do gas companies sell gas for light.

The tide of the ocean, water falls like Niagara, Genesee, Catskill, and others, the wind, and the thousand gas wells in New York, Pennsylvania, Virginia, Ohio, and Michigan, may be set to work, their great power united and stored to be drawn from.

The one thing necessary to successfully carry into effect and accomplish this great object is a highway that shall be safe, durable, and simple in its construction, for the transmission of this stored power to its thousand consumers.

These several powers, mighty as they are, can be united and stored as one power, its successful application to machinery accomplished and carried into operation, by laying a large pipe 6 feet in diameter (like a water main) from New York to Chicago and elsewhere where required, the pipe to stand 250 pounds pressure per square inch, and be a receiver of compressed air with proper inlet and discharge pipes. This pipe to be a common reservoir, and at the same time be a transmitter of the power it shall receive from air pump stations along the line.

Erect tide wheels at the seaboard, wind wheels, water wheels, and gas engines at convenient and suitable places along the line, connect with the main by air pumps, set the machinery at work, and draw from the stored power at New York, Chicago, and intermediate points at pleasure. I have given an outline of my plan for storing power, the details of which are too lengthy for an article of this nature.

The advantages to be derived from such a combination of power stored are varied and extensive, the principal of which are readiness for use, safety from fire and consequent reduction in insurance, entire absence from boiler explosions, no smoke in manufacturing cities, location at pleasure of machinery with reference to convenience and dispatch for doing business, perfect ventilation with pure air in any public or private building, and all practically without expense for fuel, engineers, or labor of any kind. In construction the pipe is its own bridge for streams and rivers; grades and curves may be made without extra cost; wheels and pumps may be made to spin and pump away without aid of engineers.

Store waste power for use, and save coal to bake bread and warm feet.

Shall we admit that this cannot be done?

E. S. VAN LIEW.

West Bay City, Mich., September 22, 1883.

The Locomotive Whistle.

To the Editor of the Scientific American:

To the testimony already furnished as to the distance locomotive whistles may be heard, I would add that the roar of trains and their whistles has come to us from Jamesburg, over eleven miles distant, besides some factory whistles from points beyond, whose exact distance is unknown. A nitroglycerine explosion, near Rahway, was heard and felt here so that it was thought to have been in my laboratory.

On June 30 last, a farmer in a hay field near here attempted to shield himself from a passing shower, by holding a fork full of hay over his head. The fork was struck by lightning, and the man killed. Since then the fork has been strongly magnetic, and was recently used to pick up tacks.

CHAS. F. RICHARDSON.

Freehold, N. J., Sept. 24, 1883.

"Dollar Weights and Measures."

To the Editor of the Scientific American:

It is charming to read the discovery of a new system of weights and measures planned out by your correspondent, Hubbell, for the benefit of mankind. It shows the decimal system in its glory, and but for its deficiency would be *non plus ultra*.

The dollar is and no doubt will be the governing agency in business transactions, but as a poise for weighing coal I think it would be rather inconvenient.

Eagles, double eagles, states, and territories! Bless your soul! who would ever get to know what they look like? And would it not be awkward to ask for trimmings or bolts 6 dollars long, when a dollar has no length at all?

Let us rather wait a little for a universal system of money, weights, and measures, that must and will come as an absolute necessity for trading with all nations, instead of trying to improve on a system past recovery.

Philadelphia, Pa., September 17, 1883. F.

Vitality of the Dried Willow Germ.

To the Editor of the Scientific American:

During the summer of 1853 Silvester Piper, now a resident of 3526 Jones Street, this city, called my attention to a willow basket in a ditch which had sprouts several inches in length all around it. A curiosity so remarkable—possibly having no parallel—led me to take immediate steps for its preservation.

I dug the basket up with the greatest care, and found it to be a worn out castaway, which had done service as a basket until it had become so badly worn as to render it worthless, when it found its way into a ditch at the base of the bank of the Illinois and Michigan Canal, about 300 feet from the Bridgeport lock (now within the city), from whence I transplanted it with great care, placing it in a wet place in my father's garden; but notwithstanding its former vitality and careful removal, the shock was too great for the tender shoots, and they all died.

The basket was made wholly or in part of unpeeled willow, whose dried and withered germs needed only the opportunity to return to life. I have often resolved to have the story of the "willow basket" written and placed upon record, while there were still living other witnesses than myself to verify it.

O. GUTHRIE.

Having seen the basket while growing, we can vouch for the truth of the above.

SILVESTER PIPER.
OTIS PIPER.

Chicago, September, 1883.

Boiler Explosion at Topeka.

To the Editor of the Scientific American:

Last night, about half-past eleven o'clock, both the boilers in the Shawnee flouring mills, of this city, exploded with terrific force. Pieces of stone, brick, sheet iron, wood, etc., were scattered in all directions for the distance of a block or more. The engineer, Leroy Mills, was scalded so that he died this morning at ten o'clock, after suffering intense agony.

There were two boilers, used to run an engine of 100 horse power. The engine room was built in an alcove of the main structure, and was a building 30 x 50 feet, one story high, built of brick and stone. The building and contents were blown to atoms, except the engine, which was not materially damaged. The main parts of both boilers were blown through two stone walls, each 18 inches thick, into the flour room of the mill. Brick, stone, and mortar were thrown in among the millstones and rollers, but the machinery is little injured. The loss is estimated at $5,000. A boiler head with about six feet of the boiler attached, and weighing five or six hundred pounds, was blown west of the mills about two blocks. A piece of casting, weighing about three hundred pounds was found in the center of Kansas Avenue, one hundred yards off, and a piece was found a block from the mills in the opposite direction.

Several theories are advanced as to the cause of the explosion. According to the night miller, who was in the engine room not more than two minutes before the disaster occurred, the water in the gauge was at its usual height. He says there was about seventy pounds of steam on at the time. Mr. Griswold, one of the proprietors of the mill, said this morning: "We shut down yesterday and cleaned out the boilers, and it is my firm belief that the explosion must have been caused by a want of water in the boilers. The probabilities are that the pump pipes got stopped up some way or other, so they could not discharge their supply of water into the boilers. Before starting the engines, at five o'clock, the boilers were filled, as shown by the water gauge, and I believe a speck of dirt got into the instrument then, thus holding the supply of water and deceiving the poor engineer. The boilers were put in about one year ago, and therefore could not have been worn out."

Your correspondent measured a spot in a large piece of one of the boilers which was but one-twenty-fourth of an inch in thickness, and it did not have any appearance of having been torn so thin. Another place was two-thirtieths and another three-eighths, the latter figure being the thickest part. The measurements were made with a pair of calipers and a steel rule, graduated to one-hundredths of an inch. It was impossible for me to tell just what part of the boiler this piece came from.

Messrs. W. Tweedale and John Richards, both practical engineers, viewed the ruins this morning and each advanced a theory. One is that the lower parts of the boilers were worn and burned so that they leaked the water out nearly as fast as it was pumped in, and the other is that there had not been water in the boilers for so long a time that a pressure of seventy or eighty pounds of steam was greater than the iron so burned or worn could stand, and it therefore gave way.

A. E. D.

Topeka, Kansas, September 4, 1883.

American Laboratories for Instruction.

To the Editor of the Scientific American:

An article in your paper of June 16 has recently been brought to my notice. It is entitled "The French Physical Laboratories;" and while describing well the work done at the Sorbonne by Prof. Desain, the writer makes statements which come short of giving due credit to what has been accomplished in this country, not only in the line of original research, but also in the establishment of schools for instruction in the special departments of chemistry and of physics. He says: "But the day is passed when chemical students are obliged to cross the ocean. Nine years ago a chemical laboratory was opened in this city, where analysis was taught and practiced, and six or seven years ago a laboratory for research, equal to any in Europe, was opened in Baltimore."

Now it is true that he does not directly assert that these two institutions were the first of their class on this side of the Atlantic, and stood alone, but that is certainly the only fair inference to be made. Again, he says: "About ten years ago Professor Pickering established the first working physical laboratory for purposes of instruction in the Institute of Technology in Boston." This is positively wrong; he ought not to have written without being sure of his statements.

Let us look back a little and see what has really been done in the direction indicated. Forty years ago, that is, in 1843, Prof. Silliman (Benjamin Silliman, Jr., as he was then) commenced to give instruction, on the plan of Liebig, to private pupils in analytical chemistry and in original research. Among the first of these pupils were John P. Norton and T. Sterry Hunt. The instruction was given in an apartment of the old laboratory of Yale College, but it was entirely a private enterprise, and continued so for four years. In 1847 the school had grown so far that the College organized a fourth department devoted to philosophy and the arts, and the first appointments to this "Yale Scientific School" as professors were of Mr. Silliman and Mr. Norton. The Sheffield Scientific School is the successor in this line, taking its name in consequence of the munificent liberality of Mr. Joseph Sheffield. Three of the professors at the present time in the Sheffield Scientific School—Brewer, Brush, and Johnson—are among the first students of the Yale Scientific School. The impulse to advance in knowledge which has been given by those who have had their sole training here within the last forty years is most certainly not to be ignored.

An endowment of $50,000 in 1848 by Mr. Abbot Lawrence established the Lawrence Scientific School at Harvard, and Professor Horsford was placed at its head. The institution has experienced a series of changes, but in the midst of them all has furnished a most valuable amount of instruction. When Prof. Horsford resigned and Prof. Gibbes succeeded him, the Rumford Fund was diverted to the support of this department, but that has since been restored to the intent of the founder, and goes now to sustain the Engineering School under Prof. Eustice, the chemistry being assigned to Prof. Cooke.

In 1864 the School of Mines was inaugurated in Columbia College, under the charge of Dr. Chandler and Prof. Eggleston. And again, in 1864, not "about ten years ago," the Technological Institute of Boston was originated and endowed. This was due in its inception and its completion to Prof. W. B. Rogers, for a long time one of its governing board, and later still its president. He lived to see his great work yielding results which perhaps fully realized his highest anticipations, and crowned with honors he has, as we all so well remember, but recently passed away. One part of the plan which he elaborated involved thorough instruction in physical research, and the construction and fitting up of a laboratory thoroughly provided with the means of such instruction. This was done under the supervision of Prof. Pickering, who was placed at the head of that department. It is scarcely necessary to speak of what that institute and that department has done. Like Lexington and Bunker Hill, there they are; "they speak for themselves."

Perhaps there is no need of going further. But from these few statements it seems as though we might trace back instruction in chemistry and in physics somewhat more than "nine years" or "ten years" in America.

W. O. A.

Conversion of Light into Electricity.

The production of light from electricity is so well known that it may have seemed singular that light would not generate electricity. The latter has actually been accomplished by Sauer, who has constructed a battery that acts only in sunlight. In this case it is the chemical constituent of the light that furnishes the power. Heat rays acting upon a thermo pile also produce a current.

Sauer's battery consists of a glass vessel containing a solution of 15 parts of table salt and 7 parts of sulphate of copper in 106 parts of water. Within is a porous cell containing mercury. One electrode is made of platinum and is put in the mercury; the other is of sulphide of silver and is placed in the salt solution. Both are connected with a galvanometer, and the whole is inclosed in a box, when not in use. When the battery is placed in the sunlight, the galvanometer needle is deflected to a certain point and the sulphide of silver is found to be the negative pole. Any change in the intensity of the light, such as a cloud over the sun, is indicated by the needle. The action of the battery depends on the effect of the chloride of copper upon the mercury. Subchloride is formed and reduces the sulphide of silver, but this can only take place with the aid of sunlight.

Hitherto the only manner in which light seemed to affect electrical action was by increasing the resistance of a selenium cell, and all photo-electrical experiments were based on this phenomenon.

Sauer's battery will be found described in the *Electrotechnische Zeitschrift*.

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SKETCHES AT THE FISHERIES EXHIBITION.

The International Fisheries Exhibition in the Horticultural Society's Gardens at South Kensington, London, attracts large numbers of visitors..

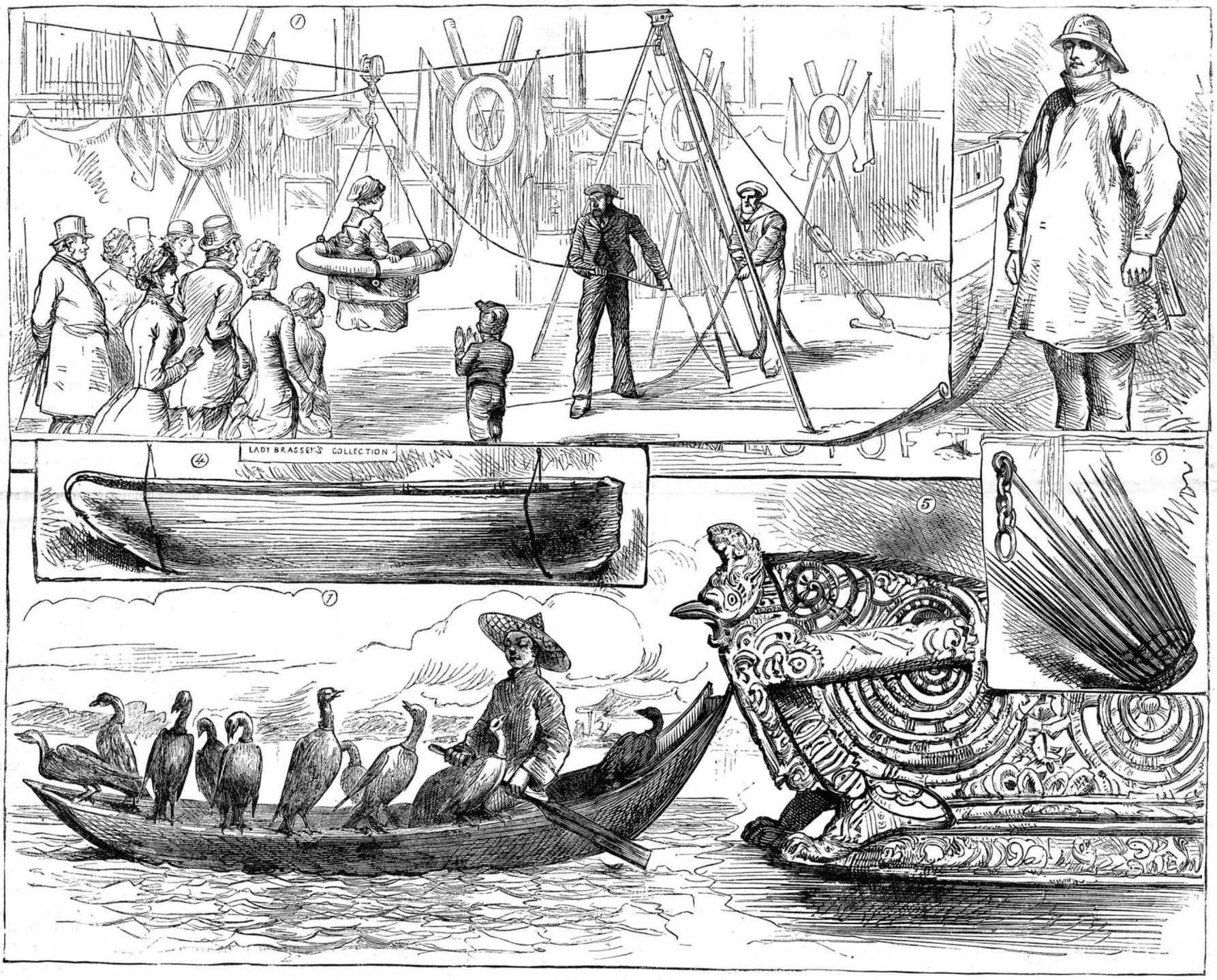
The rocket life-saving apparatus of the Board of Trade is shown in action, with a person seated in the receptacle to be hauled ashore by a pulley suspended from the cable, as represented in our illustration. There is a large collection of beautifully constructed life-boats, surf-boats, and life-rafts, and unsinkable or self-righting vessels. A life-saving kite that will drop at command, and carry a light at night, affords an ingenious method of communication with the shore. A variety of dresses in which it is impossible to get under the water, patent rafts made out of deck seats, two of which will carry fifteen persons with water and provisions, water-tight tubular rafts, and other inventions for saving men from being drowned, are found in this department.

One division of the Exhibition, which is found in the eastern arcade, consists of articles of apparel and personal equipment for fishermen; but there are examples of this kind, displayed on life-sized figures standing here or there, in different parts of the buildings. We present a sketch of the figure of a Norfolk fisherman attired for wet weather. Waterproof oilskin clothing, boots of different lengths for wading, sou'wester hats and caps, knitted guernseys or jerseys, mittens and stockings, comfortable for warmth, and in a great variety of patterns, are exhibited. Specimens of hand knitting from the Shetland Isles are contributed by a benevolent lady, Mrs. G. Bain, of Eton Road, Haverstock Hill, who wishes to promote that domestic industry practiced by the women and girls of the Shetland population.

The valuable and interesting collections of curiosities from the South Sea Islands and the East Asiatic Archipelago brought home by Lady Brassey in the voyage of the Sunbeam, is of special interest. It contains a beautiful display of corals, said to be worth £5,000, and the cloak or robe of bright red and yellow feathers, from the Sandwich Islands. In the Life-boat Gallery are Lady Brassey's canoes and models of vessels, including one of the Viking ship found in 1880 at Gokstad, on the coast of Norway, besides several models of Chinese and Japanese junks, in ivory, tortoise-shell, wood, porcelain, and bronze; and a canoe formed of the hollowed-out trunk of a tree, from Maitea, in the South Sea Islands. Her Ladyship also contributes the elaborately carved figure-head of a grand canoe which belonged to the natives of Queen Charlotte's Sound in 1774, and in which the chiefs of the tribe came to meet Captain Cook when his ship, the Resolution, lay in that harbor, on his second voyage of discovery.

The Chinese Court at the Exhibition is decorated in a curious and attractive manner, and is filled with entertaining objects; models of fishing junks, manned by queer little figures, the faces and lively gestures of which are extremely amusing; and a large model to show the art of fishing by the aid of trained birds, cormorants, thirteen of which, having ropes tied about their necks, accompany a Chinaman seated in his boat. This kind of fishing is carried on in lagoons where there is no tide. When training first commences, a string is tied to one leg of the bird, the other end being fastened to the bank of the pond. They are then made to enter the water on the fisherman giving one kind of whistle; some fish are thrown to them, and they are called out by another whistle. After six weeks of this practice they are trained from a boat. When used for fishing they are kept short of food in the morning, and a hempen ring is fastened round their throats to prevent them from swallowing the fish. When their work is done they are either allowed to fish for themselves, or else the fisherman feeds them. A cormorant serves about five years. Besides this method, the Chinese make great use of stake nets and all sorts of appliances for catching fish by means of blocking their passage on the fall of the tide.

We are indebted to the *Illustrated London News* for our sketches and the foregoing particulars.



1.—Life-Saving Apparatus of Board of Trade.
2.—Norfolk Fisherman in Wet Weather Dress.
4.—Canoe from South Sea Islands (Lady Brassey's Collection).
5.—Figurehead of War Canoe, Queen Charlotte's Sound, 1774.
6.—Mussel Dredge, from the Orkneys.
7.—Model of Fishing-Boat with Cormorants, from Ningpo, China.

SKETCHES AT THE INTERNATIONAL FISHERIES EXHIBITION.

Uses of the Microscope in Brewing.

Absolutely pure yeast is probably unknown, for it is practically impossible to obtain a large bulk of the cells of *Saccharomyces cerevisiæ* without some admixture with foreign ferments. Careful search by the aid of a high power microscope, using several fields for observation, will always reveal some other organisms; but by careful cultivation and by rejecting the first and last portions of the yeast thrown off from a fermenting wort, a comparatively pure yeast may be obtained. We have, says the *Brewers' Guardian*, repeatedly impressed upon brewers the very great importance of obtaining yeast as pure as possible for pitching purposes, and have advised continual and diligent search with the microscope, followed by a system of careful selection; brewers must not, however, be disappointed, if they fail to achieve an impossibility, that is, to obtain a yeast in which no organisms but *Saccharomyces cerevisiæ* can be detected.

The process of manufacturing vinegar is a most interesting one, and illustrates in a very remarkable manner the action of a particular organism in developing a product peculiar to itself. The ferment *Mycoderma aceti* is the organism which develops acetic acid from alcohol, and while being the dread of the brewer, is fostered and well cared for by the vinegar maker. In the preliminary operations of preparing the wort the brewer and vinegar maker follow very similar methods, but while the former boils and prepares his wort for fermentation, the latter adds yeast to the unboiled sweet wort, and endeavors to produce as much alcohol as possible. There are very many details in the process of manufacturing vinegar which must be of interest to the brewer, and therefore we propose in our next issue to commence a short series of articles on this industry.

The red mould of barley is the subject of a recent communication by Mr. G. C. Matthews to the Royal Microscopical Society, and it is of much interest to maltsters and barley growers. In the malting season of 1879–80, when the quality of most of the English grown barleys was decidedly inferior, the author noticed the frequency of occurrence of so-called "red corns" among the couches of a malt house, where various samples of English barley were being worked up. This appearance was due to a mould, which Dr. Hansen, of Copenhagen, determined to be either *Fusarium graminarium*, or some closely allied species whose life history had not been traced. To the maltster the appearance of these red corns is probably not unfamiliar, though they are only seen in any quantity during the malting season of inferior barleys. The mould is chiefly at the germinal end of the corn and exhibits a conspicuous crimson color. To facilitate investigation, the mould was cultivated in various ways well known to fungologists. Different kinds of barley, including Saale, French, Chilian, and Californian samples, were treated in this way, and yielded similar bodies, though in varying quantities. An examination of the dust under barley heaps showed that the greater portion consisted of earthy matter, but, in addition, mould spores, infusoria, and bacteria similar to those obtained from barley.

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Imported Matches.

Residents and strangers in New York city must have noticed, during the latter part of the summer, the offering for sale on the streets of matches in boxes of foreign appearance, the price asked being lower than that of our domestic matches. These foreign matches are as different as their nationality, for they come from Switzerland, Bohemia, Italy, and Sweden. Those from Italy are especially attractive, being in reality miniature paraffine candles, having a fine cotton wick and being only about one and a half inches long. They burn with a clear, white flame, and last a sufficient time to light several lamps. They are put up in neatly embossed boxes with a sliding drawer that opens by a bit of concealed elastic cord, and closes by the same means on being slightly pushed back. The other sorts are similar to those manufactured here.

Why these foreign matches are now for the first time introduced in large quantities to this market is explained by the Act of Congress, by which the tax of one cent on each one hundred matches, whether domestic or foreign, was removed July 1. This tax was more onerous on foreign makers than on our home manufacturers, because, as the government required that the attaching of the stamps should be done while the goods were in bond, and by customs officials, it proved an expensive operation and generally necessitated the repacking of the small boxes by reason of the destruction of labels, wrappers, and oftentimes the boxes. The domestic manufacturers made a slight reduction in price on the removal of the stamp tax, but it was less than the amount of the tax. Although there has been no reduction in the duty on imported matches, there has been a change in the conditions and expenses attendant on their importation by reason of the removal of the stamp tax, that enables our merchants to import Swiss and Bohemian matches, and after paying the government the thirty-five per cent duty exacted, sell them to the dealers at a lower price than is asked for the domestic monoply matches.

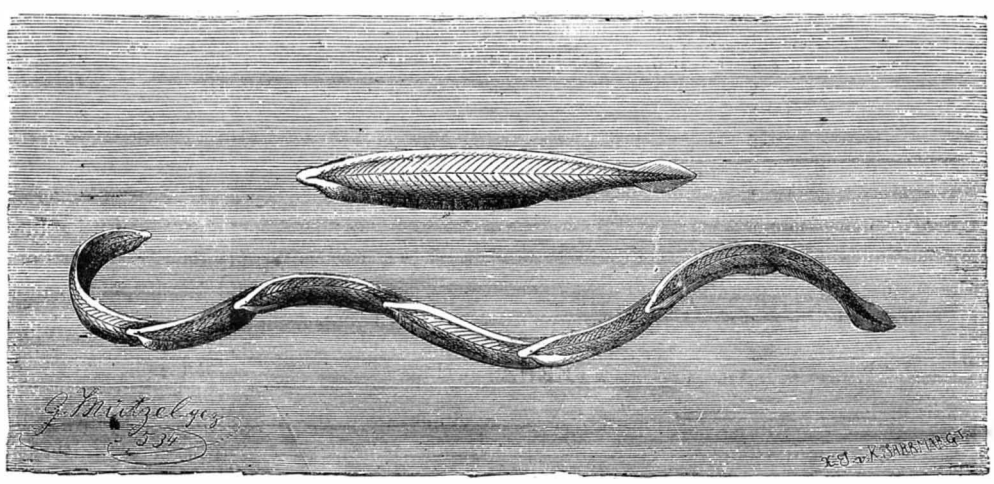
Cement for Milk Glass.

Waechter describes the following method of preparing a white enamel for joining milk glass:

Melt together three parts of red lead, two of white sand, and three of crystallized boracic acid in a Hessian crucible. The melted mass is poured out on a plate of metal and finely pulverized. This is mixed with gum tragacanth and applied to the glass and the pieces pressed together. Finally it is heated in a muffle, but not enough to entirely melt the enamel, but only soften it enough to make it unite with the glass.

THE LANCELET FISH.

The lancelet (*Amphioxus lanceolatus*) has so little similarity to other members of the fish family that for a long time it was undecided whether it belonged to the vertebrate or invertebrate class. Its body is about five centimeters long, slender and angular, symmetrically tapering off to a point at each end. A slender fin extends from the head around the extremity of the tail and terminates at the vent. The mouth, a mere longitudinal fissure, is under the front part of the body, and its orifice is crossed by numerous cirri. This fish has no heart, the place of that organ being taken by tubular vessels having a pulsating motion, which drives the transparent, colorless blood into the smaller veins. It has no bones, the muscles being attached to soft cartilage, and the spinal cord is not protected by a bony covering. The body is covered by a delicate skin without scales. It is found in the seas of the torrid and temperate zones. It lives in the sand, in which it buries itself, and being so nearly the color of the sand, it is completely concealed, and is often only perceived when the sand is washed through a fine meshed sieve. Probably, wherever it makes its appearance it is far more abundant than is generally supposed. If it is necessary for it to leave the sand, it swims through the water with a gliding, serpent-like motion, and with the quickness of an arrow, but in a short time it embeds itself again in the sand. Mr. Couch was the first captor of this fish on the British coast, and found his first specimen in the sand about fifty feet from the receding tide. He says that when swimming the head can hardly be distinguished from the tail.



THE LANCELET FISH.

Mr. Wilde put one of these fish in a tumbler of water. "It moved around the glass like an eel, and, although no eyes were perceptible, it avoided the finger or any substance put in its way, stopping suddenly or turning aside from it." The mouth is surrounded by cilia, the motion of which causes the passage of water for food and for breathing.

These fish have a peculiar and remarkable power of attaching themselves to each other, sometimes clustering together, sometimes forming a string from fifteen to twenty centimeters long. In the latter case they swim in unison, with a serpent-like motion. When swimming in a line they adhere to each other by their flat sides, the head of one coming up about one-third on the body of the one before it, as seen in the engraving.—*From Brehm's Animal Life.*

THE STAR NOSED MOLE.

The star-nosed mole is strictly an American animal, and its genus is confined to America alone. Its great peculiarity lies in the strange formation of its nose, or rather its nasal appendages. The muzzle, which is a kind of cartilaginous disk, sending out about 20 fibers or feelers, when viewed from the front has the appearance of a star, hence the common name, "star-nosed." The two cartilaginous fibers situated beneath the nostrils are the shortest. The use of this radiating process has not been fully ascertained, but it is quite probable that it is extremely sensitive, and is used for detecting the presence of its prey. It always touches or feels an object with this "star" before swallowing it.

The star-nose is subterranean in its habits, and rarely quits

THE STAR NOSED MOLE.

the ground, at least during the day, and hence it is seldom seen. It is generally found in moist valleys along the banks of streams, and consequently does not damage gardens and lawns by digging furrows through them, like the common mole. Its food consists of earth worms, and the grubs of beetles, cicadas, and other ground dwelling insects. In captivity it will eat raw meat of any kind.

During the breeding season the tail of the star-nose becomes greatly enlarged, and this form has been described as a *new* species. Its fore feet, like all the moles, are very powerful for the size of the animal, and are formed for burrowing in the ground. It makes rapid progress in soft earth, but upon the surface its movements are awkward and slow.

Its nest is large, and composed of withered grasses and leaves, and is mostly situated in an excavation beneath a stump or log. In the very young animals, the radiations on the nose are but slightly developed.

Its eyes are small and rudimentary, almost concealed in the fur, and it is extremely doubtful whether they have the power of vision even in the slightest degree. In their dark burrows eyes would be of no use to them; on the contrary, they would be a source of inconvenience, inasmuch as they would continually be irritated by sand and dirt. There is an orifice in place of an external ear, which does not project beyond the skin.

The body is covered with dense soft fur, brownish black above, a shade lighter beneath. The length of the body of the star-nose is about 5 inches, and of the tail 3 inches.

C. FEW SEISS.

A Natural Refrigerator.

It is a remarkable fact that while brewers expend an enormous amount annually on the construction, maintenance, and working of refrigerating machines, they have at hand an unlimited supply of natural cooling power, which might be obtained at a merely nominal outlay. The waters from very deep wells come to the surface at a temperature which altogether preclude their use for refrigerating purposes, and in London, where company's water is very frequently used, it is occasionally delivered at the brewery in summer time at 70° Fah., and upward. As brewers require to bring their worts down to about 55° Fah. prior to pitching, and subsequently have to use a large volume of water at less than this temperature for attemperating purposes, some artificial refrigeration becomes a necessity. Now, the earth at a certain depth has a constant temperature lower than those we have named; for about 24 feet down the temperature of the crust of the earth is influenced by the climate and the season, but at from 24 to 36 feet the temperature in all climates and in all seasons remains nearly constant, only varying about 5° Fah.; the temperature of the earth at 30 feet from the surface is always about 51° Fah., and this is the natural refrigerator we refer to. If water from a very deep well or from any other source where the temperature is considerably higher than 51° Fah. were conveyed down again into the earth to the depth of about 30 feet, and there run through a considerable length of thin metallic piping, it would necessarily give up its heat, and on being forced again to the surface would have a temperature closely approximating to 51° Fah. The construction of such a natural refrigerator ought not to be impossible or impracticable; the water should pass through a wide tube in its downward course, and at a temperature of about 30 feet be distributed through a number of smaller horizontal tubes made of some good conducting material, and then be collected again into a single tube of large diameter, made of or covered with some non-conducting material, by which the water would be forced to the surface again, and at a temperature very little in excess of 51° Fah. At this season of the year such a system of refrigeration would be invaluable, and the only expense after the first cost of laying down the pipes would be the cost of pumping. As the stratum of earth surrounding each horizontal tube would gradually acquire the temperature of the warm water passed through it, it would be necessary to provide a number of cooling tubes, so that while some were in use, others a little distance apart would be gradually acquiring the mean temperature of earth again.—*Brewers' Guardian.*

The Cost of Wrought Iron Framing.

It is a fact quite worthy of note in connection with the use of wrought iron bars and plates, in the more modern designs of roofs and other similar framed work in buildings, that the amount of what may be called blacksmith's work, or forged pieces, has steadily diminished in quantity and in complexity until now there is very little of it left. This fact does not by any means indicate that the fitting or joining of the parts has been slighted, or been done carelessly, but it is due to the constant study of those who plan such work to simplify the whole, so that the usual range of work called for may be reduced in cost to the lowest practicable limit, and also, an equally important thing, so that there may be the largest possible inducement for the use of such work in new directions.

This need of simplicity of construction and of reduced cost has led to the furnishing by many rolling mills of bars of a great variety of forms, so that in the use of them, even in a complicated piece of framing, the only hand labor that need be done is found to be the bending, or twisting, or flattening out of these bars, all of which can be done at a comparatively low heat, and by men of very moderate skill. The joining of such parts has come to be almost wholly a matter of the fitting of plain pins, turned for the more important work, and the driving of rivets, all of which involve care and skillful oversight, but no special skill on the part of the individual workmen themselves.

For some of the tension rods, and similar parts, of iron frames there will probably always be some welding needed, as these members are usually made of the best iron, and hence, to save cost, must be kept as light in weight as possible. Hence the need, in the ends of these parts, for joining them one to another, of a welded eye, so that the fullest strength shall be maintained for the size of bar used, or more correctly, so that the full strength shall be preserved throughout every part of it when made up into the finished form. In the forming and welding of these eyes the smith's work is of the most elementary sort, the bending of the end back upon itself, and the making of the simplest form of a scarf weld, being the whole of it.

The great care which has thus been given to these details of design, both in the ideas involved in the combination of parts, and in the putting of them into the forms of actual construction, has led to very large reductions in cost price of all such work, and hence to an expansion of the business of making wrought iron framed work which is nearly incredible, even to those who have been familiar with each step of this advance during its progress.—*P. Barnes, in the Industrial World.*

Now that the exploded boiler of the Riverdale has been thoroughly inspected, some one suggests if it would not be well for the boilers of certain other steamboats to be inspected before they burst; and we beg to ask whether it would not be well to have an examination made as to the capability and practices of some of the steam boiler inspectors.

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Honigmann's Fireless Locomotive.

The fireless engine of Mr. Honigmann has created a considerable stir on the Continent, and has been hailed by some of our contemporaries as an epoch-making invention for which they predict a future more brilliant than that of electricity, as the new engine will run and work anywhere without any conductive connection with some station being necessary. When the boiler has been charged the engine is ready for use, and works like any ordinary engine; but after the steam has performed its ordinary duty in the cylinder, it supplies, by becoming condensed, the heat which produces a fresh portion of steam, and the more quickly the piston works the more force will be liberated. The engine thus appears to be its own source of power, and to savor somewhat of the *perpetuum mobile*. The limit of action, from want of coal in the ordinary case, here sets in with want of strong caustic soda, which by the continuous absorption of steam finally becomes too diluted.

When the engine has thus exhausted itself, both the water and the soda solution have to be drawn off, the soda to be concentrated again by evaporation, the boiler to be refilled with water of the required temperature. A continuous process is, therefore, with the present arrangement at any rate, impossible. To Mr. Honigmann is due the high merit of having ingeniously applied and rendered fit for commercial, and under certain conditions effective, use, a principle which, although known long before the idea of practically applying electricity was more largely ventilated, and although its utilization did not necessitate the removal of the numerous obstacles which barred the progress of its now so successful rival, has still remained undeveloped until now, when general attention seems to be rather diverted from the steam engine.

In England the first observation of the property of saline solutions to become by the absorption of steam heated up to their own higher lying boiling points, was probably made by Faraday. When about to publish his discovery in the *Journal* of the Royal Institution, Faraday was informed by Dr. Ure that, according to M. Clément, the fact was already known in France, and he decided in consequence to refrain from any publication in the *Journal* of the Royal Institution, but to send a detailed report on his researches to the *Annales de Chimie et Physique*. His communication was printed with some remarks from the pen of Gay-Lussac (then editor, together with Arago), which remarks Gay-Lussac trusted would not be interpreted by Faraday in an unfavorable way. Faraday held a thermometer in a current of steam until the mercury steadily marked 212°; then when a little powdered niter was placed on the bulb, the mercury rose up to 234°. Various other salts, sugar, and also caustic potash gave similar results, the potash being particularly effective for two reasons.

Pure water has, under normal pressure, one fixed boiling point beyond which it cannot be heated. By adding particles of any soluble substances (the mere suspension of earthy matter, etc., would not make any difference), the boiling point is raised as these particles condense the vapor, and the heat thus liberated is capable of further heating the solution. The production of artificial cold by mixing snow and ice is due to the same cause, although the effect is the very opposite. In the case of caustic potash or sulphuric acid, this effect is increased by the heat generated by the chemical combination of the respective body with water. Whether there is really a difference in principle between an ordinary, physical solution of sugar, for instance, in water, and the chemical, combination productive of great heat, between potash and water, as Faraday then assumed, is still an open question; the majority at present perhaps deny such a difference.

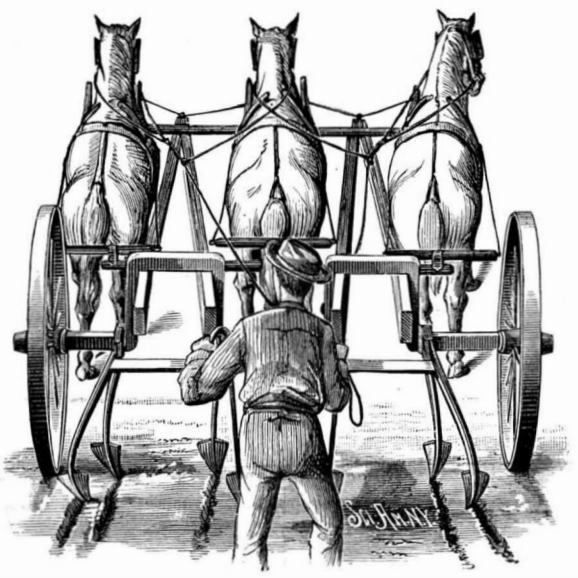
Faraday further observed that the same additional 22°, which may be imparted to a niter solution by steam of 212°, would also result from a similar treatment with overheated steam under high pressure; but he did not believe that this peculiarity of saline solutions would admit of any practical application besides, perhaps, heating sirups and lyes. He also mentioned that the ignorance of this fact had led to erroneous statements about the temperature of steam, which, in his opinion, was always 212°, no matter whether it arose from pure water or salt solutions; a thermometer placed above a boiling mixture might indicate higher temperature, because particles splashed on to the bulb would create an increase of temperature if the bulb was not carefully kept clean.

Guy-Lussac disagreed as to the temperature of vapors. This is another not quite settled question; in general, however, Gay-Lussac's views are at present indorsed, and have been confirmed also by the more recent investigations of Mr. Magnus, who found that the vapor above a liquid becomes continuously hotter with the liquid itself, though probably not to the full degree, the vapor remaining a little the cooler of the two. Gay-Lussac held, both on theoretical and experimental evidence, that the temperature of a vapor must be that of the liquid film with which it is in immediate contact. So long as the steam is not formed in abundance it will not show a temperature higher than 212°, because it is easily cooled again, having a comparatively low heat; if all cooling, however, is prevented and steam is produced in abundance, the above law will be proved correct. In a water column 33 feet high, capable of balancing the atmospheric pressure, vapor of 251° can be formed in the lower part; in entering higher strata with less pressure this vapor will become dilated and cooled; and finally escaping at the surface, it will only have the temperature of boiling water.

Saline solutions, however, capable of condensing steam in proportion to the molecular affinity of the respective salt, will yield steam of their own temperature. With regard to the historical side of the question, Gay-Lussac adds that he, as well as Clément and Desormes, had made Faraday's observations a dozen years previously; none of them had written about it or more minutely investigated the matter, as this peculiarity was a necessary consequence of the power of salts in solution to retard ebullition; and because it would follow that the temperature to which a saline solution might be raised by absorption of steam must be that of its own boiling point, a fact which Faraday's experimental table published on this occasion confirmed. We cannot say that this peculiarity has been forgotten, as the experiment is not unfrequently made in physical laboratories; yet none before Mr. Honigmann seems to have perceived how easily and effectively it can be rendered useful.—*Engineering.*

IMPROVED CULTIVATOR.

On the axle, which is arched twice, as shown in the accompanying engraving, are hung four double plows, or four sets of double shovels similar to those used in ordinary cultivators. These are united in pairs by connecting rods, so that one handle attached to each rod serves to raise or lower both plows of the pair, thus making it necessary to have but two handles. To the arches of the axle are connected two shafts arranged for using three horses. On the shaft near the axle are double whiffletrees, and upon the outer ends of the shafts are neck yokes, the use of these being to equalize the load. With a cultivator of this description two rows of corn can be operated on at once, and with



FLOWERS' IMPROVED CULTIVATOR.

less time and labor than with two ordinary corn cultivators. This cultivator has been patented by Mr. William J. Flowers, of Rondo, Mo.

Mr. Cromwell Fleetwood Varley, F.R.S.

We regret to announce the death of Mr. Cromwell Fleetwood Varley, which took place September 2, at his residence at Bexley Heath, Kent. For some years past Mr. Varley had been incapacitated by failing health from the active pursuit either of business or science, and consequently the prominent place which he once held in the scientific world has been filled by others, and his name had dropped out of the catalogue of those to whom the public looks for "light and leading." But those of our readers who can recall the intense national interest which was evoked by the early attempts to lay a submarine cable between this country and America, will remember the prominent position which "Varley the electrician," as he was often called, then held in the general esteem. The first cable was a failure, and the confidence of investors was shaken in the possibilty both of successfully accomplishing the undertaking and of turning it to commercial account, even if completed. Before the project for the second cable was published, it was referred to a committee consisting of Stephenson, Fairbairn, and Varley to report as to its capabilities and the probability of its success. It was at this time that Mr. Varley struck the idea of making an artificial line, composed of resistances and condensers, which should exactly represent the working conditions of a submarine cable. The resistances corresponded to the copper conductor, while the condenser reproduced the induction which takes place between the two sides of the di-electric, and thus by aid of the artificial line it becamepossible to predicate the speed of signaling through any proposed cable, and a subject which up to that time had been much obscured, was placed upon a scientific basis. As a result of his experiments and calculations Mr. Varley offered to guarantee that the proposed cable should transmit fifteen words a minute, but in deference to a cautious suggestion from Mr. Stephenson he publicly announced that the rate would be at least twelve words; events showed that his first estimate was by no means too high. Afterward Mr. Varley read a paper at the Royal Institution upon this subject, when his lucid explanations and practical demonstrations contributed greatly to the restoration of public confidence in Atlantic telegraphy, and to the renewal of that most important enterprise.

Mr. Varley was born in 1828, and consequently had completed his fifty-fifth year. He was named after two of his ancestors, Oliver Cromwell and General Fleetwood, from both of whom he traced his descent in a direct line with exceedingly few intermediate links. Bridget Cromwell, the daughter of the Protector, married General Fleetwood, and one of their descendants, a Miss Fleetwood, was Mr. Varley's mother; it was therefore not without cause that her son bore two such distinguished names. His education was obtained at St. Saviour's, Southwark, where he was a schoolfellow of the present Sir Sydney Waterlow. After leaving school he soon became connected with telegraphy, and through the influence of Mr. Fothergill Cooke, he was engaged in 1846 by the Electric and International Telegraph Company, with whom he remained until the acquisition of the telegraphs by government, when he retired into private life, spending his time in bringing out new inventions in connection with his favorite pursuit. During the early part of his business career he attended lectures at the London Mechanics' Institute, and in connection with his brother, Mr. Cornelius Varley, he inaugurated the chemistry class there.

The first improvement Mr. Varley introduced in telegraphy was the "killing" of the wire, by giving it a slight permanent elongation, which breaks out the bad places, and removes the objectionable springiness, which results from the drawing process. Next he devised a method of localizing the faults in submarine cables, so that they could be easily found and remedied; in 1854 he patented his double current key and relay, by which it became possible to telegraph from London to Edinburgh direct; then came his polarized relay, his English patent anticipating by two days the date of Siemens' German patent for a like invention. His next improvement was the translating system for use in connection with the cables of the Dutch lines, and by its means messages were sent direct from this country to St. Petersburg with the aid of two intermediate relays. In addition to these there were a multitude of smaller matters which, although of great importance in their day, have now been superseded, and to a great extent forgotten. In 1870 Mr. Varley patented an instrument which he called a cymaphen, for the transmission of audible signals, and it is claimed for him that it contains the essentials of the modern telephone. However that may be, a year before the date of the Bell patent, music was transmitted by this instrument from the Canterbury Hall in Westminster Bridge road to the Queen's Theater in Long Acre, over an ordinary telegraph wire, with complete success.

In 1865 Mr. Varley was elected a member of the Institution of Civil Engineers, and later a fellow of the Royal Society. He likewise took great interest in the establishment of the Society of Telegraph Engineers, of the Council of which he was a member. He was twice married, and leaves two sons and two daughters.—*Engineering.*

Solubility of Uric Acid.

An accumulation of uric acid in any part of the body brings with it serious results, among which may be mentioned gout, stone, gravel, etc.

The usual method of removing such deposits consists of the free use of alkaline mineral waters.

Jahn tested the solvent power of a series of salts in solutions of 1 part to 200 water. He found that one part of lithium carbonate would dissolve 3·51 parts of uric acid. Next in value to this are sodium bicarbonate (baking soda), sodium monocarbonate (sal soda), and borax, which dissolve 1·25, 0·98, and 0·83 part of uric acid respectively. The benzoate of lithium and borocitrate of magnesium have very slight solvent powers; sodium chloride and sulphate and lithium chloride had no effect on it.

Experiments were also made with natural mineral waters (European), with the following results:

200 c. c. of	Vichy (Grande Grille) dissolved	0·765 grm.
"	Biliner sauerbrunnen	0·587 "
"	Carlsbad sprudel	0·546 "
"	Ems krahnchen	0 515 "
"	Marienbad (kreuzbrunn)	0·471 "
"	Wiesbaden (kochbrunn)	0·243 "
"	Distilled water, dissolved	0·0214 "

These experiments prove that the carbonates alone, both of the alkalies and alkaline earths, increase the solvent powers of mineral waters over uric acid. Also that when sufficiently diluted their solvent power is directly proportional to their percentage of these salts.—*Arch. Pharm.*, xxxi, 511.

Motors for Balloons.

In a late number of the *Aéronaut*, David Napoli, President of the Société de Navigation Aerienne, examines the comparative desirability of steam and electric motors for propelling long balloons. He found that a twenty horse steam engine, working for ten hours, would consume 200 kilogrammes of coal and 1,400 kilogrammes of water. An electric engine of twenty horse power, with all its supplies for ten hours' service, would weigh about 1,400 kilogrammes, which is less than the bare consumption of material in the steam engine, leaving out of the question the weight of the generator and of the mechanism of transmission.—*Chron. Industr.*

TAR may be readily removed from the hands by rubbing with the outside of fresh orange or lemon peel, and wiping dry immediately. The volatile oils in the skins dissolve the tar, so that it can be wiped off.

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RECENT INVENTION.

Head Net for Horses.

To protect a horse from being annoyed about the head and throat by flies, Messrs. Luther B. and George W. Lee, of Ridgewood, N. Y., have invented the net shown in our illustration, which can be easily placed upon a horse's head. It can also be adapted to the size of the horse. One strip of leather passes back of the ears, around the neck, and is tied by strings under the throat; a second strip is between the eyes and ears; a third below the eyes, and the fourth near the ends of the nose. To these strips the pendent pieces are fastened. There are also strings from the lowest strip to tie the net under the jaw. As an adjunct to the usual body net this new improvement is of decided practical value.

Rival to the Carson Footprints.

A correspondent of the New York *Evening Post*, writing from Greenfield, Mass., relates what wonderful footprints have been discovered from time to time in the vicinity from whence the writer pens his story.

There is probably no other part of the world which has recorded in its rocks so wonderful a story of the past as that of the red sandstone of the Connecticut River Valley. With the exception of a central range of trap rock, the entire valley is underlaid with a dark red sandstone, lying in stratified beds and extending from the highlands bordering it on the east to those on the west—a space varying in width from twenty miles on the Connecticut line to six or eight miles near the middle of Massachusetts, and gradually narrowing to about one mile on the Vermont border. This vast bed, which extends about one hundred miles, to Long Island Sound, occupies what was once the bottom of a great estuary or arm of the sea, which extended inland in the Mesozoic era and perhaps earlier. The sand and gravel, washed by the elements from the gneissic and schistose rocks of the neighboring hills, gradually filled up the valley and in the course of ages hardened into rock.

While this process was going on, the estuary, into which the tides flowed, was the home of immense numbers of animals of many different kinds, mostly of species now extinct. When the tide was out and the muddy bottom was left bare along its shores, great troops of quadrupeds and bipeds frequented the flats, where they probably found vegetable food suitable to their wants, or perhaps feasted on each other in the soul-harrowing manner depicted in some of our early schoolbooks. Among them were great ornithic reptiles representing a higher type of reptilian organization than any now existing—a sort of connecting link between the bird and the reptile—which stood ten or twelve feet high and weighed from six hundred to eight hundred pounds, whose feet measured eighteen inches long, and whose stride was from thirty to sixty inches; apterous, low-organized animals, in many respects not unlike the giant dinornis or moa of New Zealand. A dozen smaller species, some no larger than a turkey, fed in flocks along the shore, mingled with batrachians as large as an elephant, and gigantic crocodiles and lizards—or animals approaching them in form. The labyrinthodon of Europe, a frog as large as an ox, was, says Dr. Hitchock, a pygmy compared with the great otozoum of New England, whose hind feet measured twenty inches long by thirteen to fifteen wide, and whose fore feet—not more than a third as large—were probably used only when the head was brought to the ground. Beside these sported a host of smaller bipeds and quadrupeds, three-toed, four-toed, and five-toed; some with bird-like feet and some with webbed feet, some long-legged and some short legged, some with tails and some without, some graminivorous, some carnivorous, forming such a procession as mortal man never looked upon.

Eons have fled since then, the tropical climate which clothed this ancient New England valley with giant ferns and conifers has passed away, and with it have gone the wonderful organizations which once crowded the banks of its quiet waters; yet they have as truly left the story of their lives behind them as if some special antediluvian reporter had watched their gambols from the neighboring heights, depicting their forms and recording their daily acts for our benefit. Wherever they stepped along the mud bottoms, left bare by the receding tide, the plastic sand or clay took and retained the exact impression of their feet; the mud dried rapidly under the tropical sun, and on the inflowing of the tide the tracks were filled with fine sand, which made permanent the impression. The ebbing of the waters left another coating of soft mud, which was in turn tracked by the animals and covered in the same way; and so it went on, year after year, and age after age, one layer being deposited upon another until the strata had accumulated to a great thickness. It is probable that there was a gradual subsidence of the shores of the sea until the strata were piled up hundreds and thousands of feet in thickness. Under immense pressure and certain chemical conditions, these layers of sand hardened into stone, which was in time elevated above the waters. When the sand again saw the light in the form of sandstone, the layers were no longer horizontal, or nearly so, as they undoubtedly were when the otozoum walked their muddy surfaces; but, tipped or tilted by the immense internal force which threw them up, they lay at an inclination to the horizon of 30° to 50°, with a dip generally toward the east. This is the condition in which they exist to-day, and geologists compute that the strata must be from 3,000 to 15,000 feet thick.

In numerous places throughout the Connecticut Valley, where quarries have been opened in the sandstone, the fossil racks of these ancient animals have been found impressed in the stone in as perfect a condition as if they had been formed but yesterday. By far the most numerous and the best preserved specimens have been discovered at Turner's Falls, which, being near the head of the ancient estuary, seems to have been a favorite resort of the fauna of the time. The Field Farm, near there, now controlled under a lease by Mr. T. M. Stoughton, where the most satisfactory specimens have been obtained, has been frequently visited by scientific men interested in ichnology—among others by Professors Hitchcock, Silliman, Dana, Agassiz, and in 1876 by Huxley, who examined the quarry in company with Professor Marsh, of Yale College. Mr. O. H. Lebourveau, the superintendent of the excavations, told me, during a late visit there, that Professor Huxley, after examining the footprints, rapidly sketched for him on one of the slabs with a piece of chalk the outlines of the animals which made them.

The principal quarry is on a bluff, at a considerable elevation above the river, on the bank of a small inlet called the Lily Pond. The strata, which can be traced in the neighborhood to a depth of about 4,000 feet, rise in a nearly perpendicular ledge directly from the water. The dip is apparently about 45°, but it is said to be considerably greater in several places, and in one place near the river the strata are said to lap over on the top, seeming to indicate that the upheaval may have been sudden and not gradual, as is generally believed. In some parts the stone is a loose conglomerate made up of gravel and sand; in others a fine, close-grained sandstone, which readily splits into thin layers like slate or shale. It is in the latter that the tracks are found.

The quarry has been opened nearly on the top of the bluff, and as the edges of the strata lie upward a trench has been cut across it in a north and south line, exposing the face of the layers on the west side to a depth of ten or twelve feet. The stone is cut into rectangular slabs with the chisel and then split off by wedges, the slabs being generally one to two inches thick. When a part containing footprints is found, it is carefully removed to one of the buildings above and fastened in a rough frame to prevent breakage. A large number of the slabs are now on exhibition, awaiting purchasers. One, measuring twelve feet long by three feet wide, contains tracks of the otozoum, twenty-two inches long by fifteen inches wide, the stride being five feet and two inches from toe to toe.

Mr. Stoughton has one slab—named the "Huxley Slab"—which is twenty-six feet long by six feet and a half wide, and has on it four hundred small tracks. So accurately has the clay preserved every trace made upon it that in some cases it is easy to see where an animal with a broken or malformed toe has trodden. The tracks, too, of many insects, of mollusks, and some of the lower articulata are discernible, as well as marks made by fishes swimming in shallow water. Even the furrows of the ripple of this ancient sea, the blisters of the gas bubble which rose through its mud, the cracks caused by the sun, and the indentations made by the pelting rain along its shores have been preserved to us, so that we may study as easily as in a printed page the history of that primeval time, reconstructing its tropical flora and fauna and depicting the wonderful conditions of their life as clearly and accurately as if they lived in the present.

Ichnology as a science belongs wholly to this century. In 1802 Pliny Moody, of South Hadley, plowed up a stone with well defined tracks upon it, which were familiarly spoken of at the time as the tracks of poultry or of "Noah's raven." In 1835 similar footprints were discovered on some flagging stones from Montague City, which were being laid near the house of Dexter Marsh in Greenfield. Dr. James Deane, of Greenfield, whose attention had been called to them, described them in a letter to Dr. Hitchcock, President of Amherst College; and the latter, after a thorough investigation of several quarries, published in 1836 a scientific description of the tracks, with his views concerning them, which, though now regarded as substantially correct, did not obtain general acquiescence for several years. His first publication was followed by many others, in which he described more than one hundred species of animals which had left their traces in the sandstone. Professor Silliman, W. C. Redfield, Dr. Deane, Sir Charles Lyell, and others contributed also to the literature of the subject.

Within the past few years fossil footprints of extinct animals have been discovered at several places in the West, especially at Carson City, Nevada, and in other parts of the earth, but none of the localities compare in extent and in richness with the now world famous ones of the Connecticut Valley, of which that at Turner's Falls is supereminent.

Nickel Crucibles.

M. Mèrmet recommends the use of nickel crucibles instead of silver in chemical manipulations. They are slightly attacked, it is true, by melted potash, but silver itself is not indifferent to this action. They cost at first much less than silver, and moreover they have the great advantage of melting at a higher temperature. It often happens, in fact, that inexperienced chemists melt their silver crucibles in heating them over a gas lamp; such an accident is not to be feared with nickel crucibles.—*Chron. Industr.*

A New Property of Sulphate of Iron.

When ferric sulphate is as neutral as it can be, *i. e.*, it does not cause effervescence with sodium carbonate, and contains no perceptible quantity of protoxide of iron, nor any ferric chloride, which is always acid, it is capable of uniting with organic substances or vegetable extractives to form very definite and stable compounds, that are not removed by solution in water nor decomposed by contact with the air.

The organic substances in urine, as well as the phosphates, were instantly precipitated by the addition of 2 per cent of a liquid preparation having a density of 50° B., and containing 26 per cent of oxide of iron. Fresh urine treated in this way, May 16, 1882, remained odorless and unchanged more than a year, although kept in a warm room, exposed to the air. An analysis showed the precipitate to contain 5·34 per cent of nitrogen, and 12·42 per cent of phosphoric acid, representing 16·44 per cent phosphate of lime. Excrement treated with 3 per cent of this reagent remained unchanged for a year. Fish entrails were put for two days in water containing 1 per cent of the reagent, then washed a long time in water, and on the 16th of May, 1882, were dried in the open air without any bad smell. They were subsequently cut up and digested in water in which only traces of iron salt could be detected. After drying again they kept as well as ever in the air. A similar treatment again with dilute hydrochloric acid only dissolved a little more iron, and the substances did not change afterward when exposed to the air of summer.

To show that a true compound was formed between the iron salt and the organic substance, heads, intestines, the scales and skins of fishes, and ox hide were exposed to the action of this salt of iron, then dried and preserved with the greatest ease. They were subsequently mechanically divided up and exposed for several hours to the action of a boiling solution of barium chloride. A perceptible quantity of the reagent could not be detected. Barium sulphate could only be found in minimum quantities, and the mixture of these substances could be kept a long time in ordinary water. After being in contact with water for more than a hundred days only a few gas bubbles arose on stirring it up, having a slightly acid odor quite unlike sulphydric acid gas. Hence we may safely assume that a very stable compound was formed by the iron and the organic substance.

Some fish, a dog, and a rabbit were put in the iron sulphate solution. The rabbit weighed 839 grammes and remained in the solution for five days; it became stiff, its skin kept its reddish color and became so hard and horny that it could scarcely be scratched with the nail. The bath lost 6° B. in density, and after drying the surface the animal only weighed 539 grammes, having lost 36 per cent in weight. An experiment with a goat's heart showed the same loss, the bath having taken the water out of the animal. When perfectly dry, the rabbit weighed only 326 grammes. It has kept perfectly for a year, and the process of mummifying it cost less than one-tenth of a cent. Similar observations were made upon other animals.

In 1882 a horse died from a very infectious disease, and the entrails, dipped in a solution of the neutral sulphate (a few parts of the salt in a thousand of water), were used immediately for demonstration as well as for examination by the students.

A pheasant egg weighing 9·35 grammes was deprived of its shell and lost 38 per cent in the solution; it dried and shriveled up and was completely mummified, without giving out any bad smell. These results will be an incentive to further experiments.—*Comptes Rendus.*

Ferric sulphate, or persulphate of iron, is easily made from the protosulphate, or green vitriol, by the addition of a suitable quantity of sulphuric acid, enough nitric acid to oxidize the iron, and thorough boiling. It can be rendered perfectly neutral by adding, while hot, just enough ammonia to cause a slight precipitate.

Wasps and Grapes.

Most gardeners experience more or less trouble with bees and wasps on their ripening grapes at this time of year. A gardener of Strassburg-Neudorf possesses a large vine, from which the wasps in one week removed 300 pounds to 400 pounds of grapes. After trying in vain to get rid of the insect pest by attaching to the vine bottles with honey water, which attracts and drowns the wasps, he took a bucket half filled with boiling water, placed it under the grapes, and by beating the attacked vines he brushed the wasps off into the boiling water. In two hours he killed nearly two quarts of wasps. The early morning, when the wasps are stiffened with the cool air, at noon, when they are giddy from the juice which they have absorbed, and the evening are the best times for this operation.

The Telegraph not to Aid Betting.

In the House of Commons recently the Secretary of State for the Home Department was asked if his attention had been drawn to the fact that the police in London had been threatening licensed victualers with opposition to their licenses at the annual meeting, unless they at once gave up the receipt of general, sporting, parliamentary, and stock exchange news by the automatic news-transmitting instruments. The Secretary replied that it was the duty of the police to put down betting houses, and when facilities were given by means of telegraphic instruments for betting, proceedings would be taken against the holders of licenses.

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ENGINEERING INVENTION.

A practical improvement for traction engines has been patented by Mr. Benj. S. Benson, of Baltimore, Md. This invention relates to a combined differential gear and friction clutch designed so that power may be transmitted from a single shaft independently to two sets of wheels at different speeds and also so that power may be applied with a gradual strain instead of with a sudden jerk.

MECHANICAL INVENTIONS.

An improved type writing machine has been patented by Mr. A. G. Leming, of Waldron, Ark., the object being a more rapid manipulation of the type writer, and more exactness in its results. This is accomplished by absolutely exact mechanism without the adventitious aid of springs.

Mr. Alex. D. Clarke, of New York city, has obtained a patent for an ore concentrator, an improvement upon a patent granted to same inventor No. 276,775. This invention provides a new device for concentrating ore in placer mining, for washing out and separating the particles of gold and silver from the sand.

Mr. John Creagan, of Cleveland, O., has patented a machine for setting springs which is an improvement on a patent granted to Messrs. Creagan and Tyler in May, 1882. The present invention consists in certain improvements in the parts of the machine, whereby the working of the machine will be practically ameliorated.

A baling press, for cotton or hay, or other bulky substances, has been perfected by Mr. John S. Davis, of Frankfort, Ky., which will compress fibrous material by lever power, an ingenious combination of levers crowding it into a small compass. The object is to use light power—manual or animal—extending through a longer time than that of steam, which concentrates manual power in a short time, but giving out a large amount of useful force.

An improved safety stop for elevators has recently been patented by Mr. Ensebio Salom, of New Orleans, La. Perforated plates and horizontal pins are connected with the guides of the elevator, and the top cross beam of the elevator car is provided with safety hooks which are designed to fall by gravity and engage with these pins, in case the supporting cable with which the gravity hooks are connected becomes ruptured from any cause.

An improvement in circular saws has been patented by Mr. Geo. W. Stinebring, of Shreve, O. This invention consists in making the teeth, which are removable, in the form of a segment of a circle, and in making them concentric, both on the front and back edge, and further in preparing the notches of the saw in which they fit with serrations, to hold the teeth in any position in which they may be shifted to set them to the original gauge after they have been shortened by wear.

Mr. William H. Sterns, of Humboldt, Neb., has invented an improved churn, the object being to improve and simplify the construction of swing body churns in a manner to secure their more perfect balance in action and greater convenience in adjustment and operation. The invention consists in hanging the churn body in a yoke or frame suspended from the main frame of the churn, and in the arrangement with the yoke frame for the churn body of an open sided or bent yoke or bar, the axis of rotation of the latter, to cause a movement of the churn body in a circular horizontal orbit as the open yoke swings or rotates to the opposite side to balance the momentum of the churn body, the open yoke acting as a counterpoise.

An improved fastener for the meeting rails of sashes has been patented by Mr. William H. Bayles, of Montclair, N. J. The object of this invention is to provide convenient and reliable means for fastening window sashes, and the invention consists in a window sash fastening constructed with two plates hinged to each other and provided with an interposed spring, and having a catch attached to one plate, and a latch hinged to the other plate, so that the latch plate will swing up when the latch is raised, and will be fastened automatically when swung down. The same inventor has also obtained a patent for a device for locking window sashes to prevent their being opened from without, and the invention consists in a window sash fastening constructed with two plates hinged to each other by a pin, and provided with a spring arranged to close the said plates, and with a pivoted button arranged to hold them open, so that the fastening will hold the sashes securely and can be readily fastened and unfastened.

AGRICULTURAL INVENTIONS.

Mr. Geo. W. Stacy, of Marietta, Miss., has patented an improved straddle row cultivator, which cultivator is so constructed, however, that it may be used also as a mid row cultivator, or to cut up the roots of small sprouts, briers, etc.

Letters patent have been granted to Mr. Eugene W. Vest, of Sedalia, Mo., for an improved seed planter. This machine, besides being built and constructed in a manner rendering it highly practical and efficient for the work for which it is intended, is provided with an improvement by means of which the depth of the furrow and drill may be readily controlled by the weight of the machine.

MISCELLANEOUS INVENTIONS.

Mr. Samuel Wilde, of Williams, Cal., has patented a heel for boots and shoes. This heel consists in a seamless shell of sole leather filled with waste scraps mixed with glue and pressed into the shell. The heel is to be attached to the insole of the boot or shoe by means of the ordinary nails or pegs.

Mr. H. Molendo, of New York city, has patented a device for furnishing a supply of water in buildings for extinguishing fires by an automatic pump, driven, either by a located steam engine, or by the weight of water from an elevated tank supplied from a regular source; the peculiarities of the device being the handy means of admitting the outflow of water to any one or all of the floors at will.

Mr. John Weiler, of Griggsville, Ill., has invented a new and improved road cart, the invention consisting of an improved arrangement of springs for mounting the seat on the cart, which is designed to be better adapted to neutralize the swing of the shafts by the horse than other arrangements; and the invention also consists of a spring contrivance for connecting the whiffletree to the shafts, to neutralize the jerks of the horse in pulling the cart.

Mr. Isaac W. Stemen, of Elida, O., has invented a new and improved railroad signal which consists in a revolving signal of targets by day and lamps by night, set on the top of the caboose or other hind car, and geared by belts and pulleys with one of the axles of the car truck, so that the direction of their rotation will show which way the train is running, and their velocity will indicate the speed of the train, and being at rest will show that the train is standing.

A combined folding table and cupboard has recently been patented, which consists in a lower frame provided with drawers which may serve as a bureau, and with a space above the drawers into which the extension table may be folded. On top of this frame is arranged a case provided with shelves upon which books or table utensils may be deposited. The inventor of this device is Mr. Joseph H. Bartine, of Etna, Mo.

Mr. Charles A. Barnes, of West Liberty, Ia., has obtained a patent for an improved tile laying machine. This device is provided with a mould and cutters for cutting away the sides and bottom of the ditch, and the mould board is provided for raising out the cut slice, and grooving the bottom of the ditch, while the tile laying attachment follows the mould board and lays the tiles in the ditch before the earth is permitted to cave in.

Mr. George W. Bowen, of Fort Wayne, Ind., has patented an improved horseshoe. This invention consists of a horseshoe gradually decreasing in thickness from toe to heel, the taper being on its under face, and provided with a continuous calk extending from heel to heel along the outer edge of the bottom of the shoe, and made integral therewith, this calk being flared outwardly to form an enlarged bearing for the foot of a horse.

Mr. P. F. Dean, of Watsonville, Cal., has patented an improvement in the seats for dog carts and sulky wagons to prevent the up and down jolt of the seat dependent on the movement of the horse. The device is the support of the seat on the arms of a semi-rotating vertical crank by means of a suitable arm. The device has also a swivel attachment by which the seat may be turned to the side of the wagon for convenience in getting in and out.

Mr. Herbert W. Kibbe, of Utica, N. Y., has patented a perpetual calendar of convenient form that may be made of sheet metal and of so diminutive a size as to be carried in the vest pocket. It is intended not only as a current weekly and monthly calendar, but as a means of forecasting the days of the week and month, and also of determining the exact date of those which have gone. It requires no mental or written calculation, a merely mechanical operation of turning a disk being sufficient.

Mr. Jacob Coover, of Chambersburg, Pa., has invented improvements in burial vaults to be formed in the bottom or lower part of graves, and the invention has for its object to provide a strong, durable, water tight, and cheap vault, and one which will take up little space and can readily be put in place. The invention consists, principally, of supports having shoulders and lips adapted to support and hold in place the coffin lid. The design is to protect the coffin from the superincumbent weight of earth, and to defend the coffin from desecration.

An intrenching implement for military use, consisting in a combined pick and spade, has been patented by Mr. N. Willoughby Wallace, of 3 Harley Place, Clifton, County of Gloucester, England. The handle of the spade is provided with a cross head in the form of a pick, which is sheathed and pointed with steel to enable it to be used for the purposes of a pick, while the shank and blade are of such form as to enable the implement to be conveniently used either as a pick or as a spade, and to be carried with ease as a part of a soldier's accouterment.

A hand clothes washer has been patented by Mr. Isaac T. Greene, of Milford, Conn., the design of which is to spare the hands of the washerwoman, and to facilitate the cleansing of clothes by rubbing on the ordinary corrugated washboard. The inventor uses a holder—a small box suitably constructed—which contains a receptacle for soap with a perforated bottom, and under the bottom of which is a series of rollers. By this means the hands need not come in contact with the corrugations of the washboard, nor be exposed continually to the alkali of the soap.

A neat folding hook for the reception of hats, bonnets, bundles, or any light articles is patented by Messrs. August Wode and Joseph Mifflin, Jr., of Jersey City, N. J., that is intended primarily for theater and concert room seats, but may also be adapted to other purposes where a protruding hook may be in the way when not in actual use. The hook is hinged under the seat or shelf, so as to fold up against the under side of the seat when not being used, and can be swiveled out and back, being held in any position by the action of a spring on an angular projection at the rear of the hook.

Mr. Albert R. Yount, of Yountsville, Ind., has invented a new an improved fire escape which relates to that class of fire escapes in which the persons are suspended by means of a rope or cable wound around a drum provided with a governor to regulate the speed. In connection with this invention a drum is mounted loosely on a shaft connected with a governor, regulating the speed, which drum is integral with another drum of less dimensions. On each drum a rope or cable is wound, said ropes being wound in opposite directions, so that when one is unwound the other is wound up, thus permitting the same escape cable to be used consecutively by any number of persons.

A very convenient adjunct to a step ladder to facilitate the depositing of fruit taken from the tree, either upon the ground or into a wagon or cart, has been patented by Mr. D. Van Trump, of Norborne, Mo. At one side of the ladder is arranged a slide way with a bucket connected with it in such a way, that it may be slid up and down by means of a windlass located at the top of the slide way convenient to the fruit gatherer. A wing is likewise connected with the upper end of the ladder, to enable the person picking the fruit to walk partly around the tree and pick more fruit without changing the position of the ladder than would otherwise be possible.

Some improvements relating to mechanical telephones have recently been patented by Mr. Harvey E. Huston, of Monticello, Ill. In this improvement the inventor has endeavored to provide an instrument in which the sounds will be reproduced more clearly and loudly than heretofore. The invention consists in forming the diaphragm of layers of metal or some fibrous material, and of providing a mouthpiece for the transmitter, so that the whole sound will act without obstruction upon the diaphragm. The invention further consists in forming the wire with strips of wire surrounded with rubber or fabric, and in providing a suitable insulator or support to prevent the vibrations being transmitted to the ground.

Mr. Stephen N. Howard, of Eatonton, Ga., has invented a poke for horses, mules, and other pastured animals that is intended to repress and render abortive their attempts at uplifting gates and loosening fence rails, while not hindering them from grazing. To a head stall, the check pieces of which are metallic straps, there is pivoted a forked bar extending in a single bar beyond the nose, to which is attached by a slide a weight, which may be adjusted as required by the strength of the animal. This projecting bar moves freely in an upward direction, but is made rigid and in line with the animal's nose, by means of rests in the head stall, as soon as the animal attempts to operate on fences by raising his head and "throwing" by the nose or the horns.

Mr. Richard Christie, of Truro, Nova Scotia, Dominion of Canada, has invented a new and improved fire escape, the object of which is to improve that class of fire escapes in which a car is guided on stretched cables and suspended by a rope passing over a pulley and down to a windlass. Two or more chains or cables are united by rounds forming a ladder. One end of the ladder is secured to the roof of the building, or is passed over the roof of the building and held securely on the ground, and the other end of the ladder is secured to a winch on the ground, by means of which winch the ladder can be drawn as taut as may be necessary. A car of sheet iron or wire net may be sent up by the winch, on a supplementary line, provided with a hook to engage with the principal cable and be lowered by means of a guide plate on the principal cable.

NEW BOOKS AND PUBLICATIONS.

AMERICAN NEWSPAPER ANNUAL. N. W. Ayer & Son, Philadelphia, Pa.

The publishers of this volume claim to give a list of all the newspapers of the United States and Canada, together with information regarding their circulation, date of establishment, distinctive features, advertising rates, and the population of the cities and towns in which they are published. In the first half of the book the States are grouped geographically, and the cities and towns alphabetically; in the other half the States are similarly arranged, but the counties are given alphabetically. The location, natural features, and the chief products form a part of the explanations. The publishers aimed to place at the disposal of the advertiser all the information he might need, and they have collected and conveniently arranged a mass of useful material. The characteristics of any section of the country, and its probable value to those seeking business, may be obtained at a glance.

ELECTRICITY AND ITS USES. By J. Munro. Illustrated by eighty-four engravings. The Religious Tract Society, London, England.

The author's object is to give the general reader some account of the many new applications of the electric current, avoiding minute details and technical terms. The first three chapters are devoted to frictional, or static electricity, voltaic and thermo piles, and induction, the latter subject being concisely and accurately treated and its importance in the practical uses of electricity pointed out. The remaining chapters are taken up with land and submarine telegraphy, the telephone and microphone, the photophone and telephotograph, the induction balance, dynamo electric machines, the electric light, power, and heat. While the principles of the dynamo and of the arc and incandescent lights are generally explained, the author's lack of space prevented anything but a running account of their various modifications. The same remark applies to the other divisions of the book.

MANUAL OF THE RAILROADS OF THE UNITED STATES FOR 1883. By Henry V. Poor. H. V. and H. W. Poor, publishers, 70 Wall Street, New York. Effingham Wilson, Royal Exchange, London.

This is a complete compendium of the railroads of the United States, giving their routes, lengths, debts, bonds, stocks, values, equipments, and an official showing of their financial condition. The scope of the book comprehends all the railroads in the States and Territories, with their foreign connections, and the accompanying maps delineate the routes and show the salient points on the roads. The volume is quite bulky, containing 1,055 pages, and is intended for office use and desk reference. It is quite exhaustive in its details of information.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

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Fossil Meal Composition, the leading non-conducting covering for boilers, pipes, etc. See adv., p. 222.

The Sweetland Chuck. See illus. adv., p. 174.

Steam Pumps. See adv. Smith, Vaile & Co., p. 172.

Hollar's Safe and Lock Co., York, Pa., manufacturers of improved Fire and Burglar-proof Safes. Bank and Safe Deposit Vaults and Locks. See adv. p. 190.

Catalogues free.—Scientific Books, 100 pages; Electrical Books, 14 pages. E. & F. N. Spon, 35 Murray St., N. Y.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Peck's Patent Drop Press. See adv. page 205.

Machine Diamonds, J. Dickinson, 64 Nassau St., N.Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

Gould & Eberhardt's Machinists' Tools. See adv., p. 205.

Barrel, Keg, Hogshead, Stave Mach'y. See ad., p. 206.

Use King's Office Pen, patented July 31, 1883. Superior to all others. Price, $1 per gross, mailed free of postage. One dozen pens sent as samples on receipt of 10 cents. Geo. F. King & Merrill, 29 Hawley Street, Boston, Mass.

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New scientific books on Steam, the Steam Engine, Mechanics, and Engineering. Send for catalogues before purchasing. F. Keppy, Publisher, Bridgeport, Conn.

For Mill Mach'y & Mill Furnishing, see illus. adv. p.204.

Cutters for Teeth of Gear Wheels formed entirely by machinery. The Pratt & Whitney Co. Hartford, Conn.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 206.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

Aneroid Barometers, Mercurial Barometers, Thermometers, Anemometers, Hydrometers, Hygrometers. Send for catalogue. Queen & Co., Philadelphia.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., or examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) G. A. S. writes: At present I have in use a rubber cloth carriage top which has commenced to leak on account of the coating having become warm. Would like to learn of some composition easily made or readily procured which may be applied to cover to prevent leakage. I have a small quantity of a solution of gutta percha in carbon disulphide. Would this answer? A. The rubber solution you speak of is intended to be applied with heat and rubbing with a hot iron burnisher. We doubt if you can repair the wagon top satisfactorily. Thick white lead paint would do except that it would make it too stiff. Use four pounds of lead to the pint of oil, so as to make almost a paste.

(2) J. H. L. asks what quantity of "oxygen gas" is used per hour in the "oxycalcium" light for magic lantern work. Also the size of jet to use, and pressure on gas holder. A. The amount of oxygen consumed in an oxyhydrogen or oxycalcium burner depends altogether on the amount of light required, that is, provided the burner is properly made. Two feet per hour ought to yield a fair light. Of course you can consume two or three times that amount. The pressure in gas cylinders ranges from 60 to 85 pounds.

(3) H. L. writes: We are looking for a paint to use on ice racks and around doors and on shelves of refrigerators which will cover up the smell of pine and give out no offensive odor. Can you help us? A. Zinc white in oil tinted with any of the ordinary colors, well dried, ought to make an acceptable finish for refrigerator Oxide of iron or Prince's metallic paint; is a very strong and durable paint; it does not give off a disagreeable odor. It makes a good tint with zinc white. Chrome yellow is also good. These colors must be thoroughly dried to make them entirely odorless. If you cannot use oil, the only other substance that would probably answer your requirements is shellac varnish, 2 or 3 coats, drying each before the next is put on.

(4) E. K. asks: If you wished to warm a room by steam and the room is closed up, can you not raise the temperature of the room to a higher degree than the temperature of the steam at boiler pressure? Of course we mean heat by direct radiation through steam pipes. A. You cannot heat a room as hot as the steam at the boiler pressure. In drying rooms for japanned and rubber goods, a temperature is seldom obtained nearer than from 15° to 30° below the temperature of the steam in the pipes.

(5) C. F. N. asks (1) whether red rags will make white paper, or are red rags practically useless as regards paper making? A. Red rags are not used to make any other than the most ordinary grades of paper, although when capable of being well bleached they are made available by mixing with rags of a better grade 2. Again, is there any premium upon said subject? A. No premium on subject that we are aware of.

(6) F. J. F. writes: Will you please explain in Notes and Queries the process of photo-electrotyping? A. The various photographic processes as applied to printing are very thoroughly described in SUPPLEMENTS, No. 82, 143, 146, and 213, to which we refer you.

(7) J. G. from Hawaii writes: I doweled together the base and column of a marble monument with two iron half inch dowels, three inches inside, and I find that the iron rust has come through to the outside. Please let me know what I can use to take it out. A. Dilute mineral acids, such as hydrochloric acid, will wash out the iron rust; but if it has penetrated any distance, you will only injure the marble by attempting to better it, as marble likewise is soluble in the acid referred to.

(8) G. A. N. asks: 1. What is the best and lightest material to make balloons out of? A. Silk is best: linen will answer. 2. How is the material made waterproof and airtight? A. By coating it with varnish. See answer to query 13, SCIENTIFIC AMERICAN, June 9, 1883. 3. How large will a balloon have to be to carry 300 pounds, not including weight of ropes, net, and equipments? A. This can only be ascertained by consulting a practical balloonist. See SUPPLEMENT, No. 50, on the "Progress of Aeronautics."

(9) P. D. asks: 1. What per cent of gas tar is phenol in bulk? A. Percentage varies considerably with the kind of coal used to produce the tar. Calvert states that from English coals the average production varies from 3 to 14 pounds per 100 of tar. Other authorities state from 7 to 33 per cent. 2. How may it be separated from the other components? A. It is separated by fractional distillation and purification by treatment with alkalies, etc. 3. Is the process expensive? A. The process is not very expensive.

(10) M. A. asks how to prevent starch from becoming sour. A. Add a little oil of cloves or solution of salicylic acid to your starch when making it.

(11) G. B. T. writes: Will you please inform me how I can make an enamel upon zinc or other metals in white with black figures? Also, how I can prepare card board so as to render it impervious to the humidity of the air, and finish it with a smooth, glossy surface. The card board is white with black figures. I have first covered the printed board with hot starch, when dry flowed with dammar varnish. They turn yellow when exposed to the sunlight. The starch was to prevent the ink from running into the varnish. A. Calcine 100 parts lead and 20 to 30 parts of tin thoroughly. Melt 100 parts this mixture with 100 of white sand and 25 or 30 parts salt. When cool pulverize very finely. This gives a dead white enamel for the ground. The black can be formed by the addition of black oxide manganese or protoxide of iron. Apply to metal in form of a paste in water, to which a little glue has been added, and fire. Size your paper with a starch solution, and then varnish with white shellac instead of dammar.

(12) A. S. R. writes: I have some modeler's wax that is too hard; how can I temper it? How is the wax made? A. Modeling wax is made of a mixture of wax and lard. It may have other constituents, but the above are the regular ones. To make it, melt the lard and then add wax in small pieces until a sample cooled is found to have the right consistence. If too stiff, temper it with lard.

(13) G. B. C. writes: Will you please to give me the proportional increase required to make a hand electric machine similar to the one in No. 161 of SCIENTIFIC AMERICAN SUPPLEMENT, that will give twice as much of a current—the increase in number of wire and of turns, also the armature? A. Make the machine one-half larger. Wind with the same number of turns and with wire of the same size.

(14) L. L. Van L. asks for a recipe for dressing for ladies' kid leather shoes.

A. Gum shellac.....2 ounces.
Aqua ammonia .....1 ounce.
Water.....8 ounces.
Black aniline.....enough to color.

Heat the ingredients slowly together (except the aniline) until the whole is near boiling and the shellac dissolves. It may be necessary to add a little more ammonia during the boiling. Then add the aniline and water (enough to make the whole measure sixteen ounces).

(15) H. S. writes: 1. In current vol. xlix., No. 6, page 87, you speak of a new substitute for rubber, discovered by MM. Dankworth and Landers; can you tell me about how much it costs per pound? A. The article referred to is not yet in this market. 2. If two bar magnets are placed together, parallel with each other, and with opposite poles in contact, do they not become weakened or neutralized? A. No, the tendency will be to mutually strengthen each other. 3. Is it not best to place something between them to preserve their integrity? If so, what kinds of substance is it best to use, and what distance apart is it advisable to place them? A. Magnets are generally wrapped in oiled paper to keep them from rusting. It is not necessary to separate them to preserve their strength. 4. Is crystallized carbon, or diamond, a conductor of electricity? A. Diamond is practically a nonconductor of electricity.

(16) W. E. K. asks what is the best proportion of sulphuric acid and water to use with scrap zinc to generate hydrogen gas, and what quantity of gas will be generated? A. Use about one pound of acid to ten pounds of water. This is about equivalent to one measure of acid to five of water; 98 pounds of acid and 65 pounds of zinc give practically 350 cubic feet of hydrogen.

(17) G. B. G. asks what height water can be thrown through a one inch nozzle, 50 feet of 3 inch hose, attached to a hydrant of on foot diameter, the height of reservoir being two hundred feet. And is the ratio the same, or per cent of distance thrown the same under all heads? A. According to table given in "Box Hydraulics," *without* hose, height is 137 feet, but this is theoretical. According to experiments at Kingston (Jamaica), with 40 feet 2½ inch hose and seven-eighths inch nozzle, the height of jet was under a head of 156 feet, 85 feet and 84 feet; and with three lengths of hose, 64 feet and 62 feet. The result of experiments are so variable, that no reliable law or formula can be given for practical results. 2. At what height should a reservoir be placed to make the pressure sufficient for effective work in case of fire, with buildings three stories high? A. If your three stories are equal to total height of 34 or 36 feet, we think the head should not be less than 150 to 160 feet to throw an effective stream.

(18) C. C. V. asks: 1. Is there any known means of making one's hair permanently gray, by artificial means? A. We know of no means for insuring permanent white hair. 2. Can a white, hard compound be made either from caoutchouc or gutta percha? A. No satisfactory process for producing perfectly white rubber or gutta percha is known.

(19) C. H. W. writes: Can you tell me how to remove the interior or bony portion of a cow's horn in making powder horns? A. Use dilute muriatic acid; also try the effect of heat and boiling water.

(20) T. M. W. writes: Can you give me some information in regard to the flux used in the process of zinc coating? The writer has made various trials, and has succeeded in doing very fair work, but not as good as the best; and the loss of metal from oxidation is so great that it is evident the right flux has not been used. A. The iron articles are cleaned if necessary by dilute sulphuric or hydrochloric acid, and with emery. They then are dipped in a saturated solution of chloride of zinc and salammoniac. Salammoniac is kept upon the surface of the melted zinc, and the iron articles are plunged into the melted metal through the salammoniac. This salt is the flux you ask for Do not have your bath too hot, and you will have no trouble. Sometimes one-sixth part of mercury and a very little sodium are added to the melted zinc. The latter should not exceed one two-thousandth of the zinc.

(21) J. E. B. writes: I have a set of ivory handled knives whose handles have turned yellow with use. How can the original whiteness be restored to ivory under such circumstances? A. Binoxide of hydrogen is used for bleaching ivory. It is also recommended to expose the ivory to strong sunlight under a glass covering. This will sometimes bleach it.

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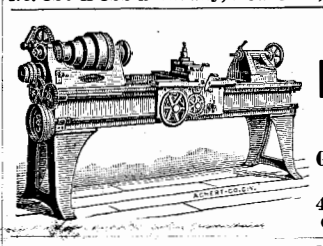
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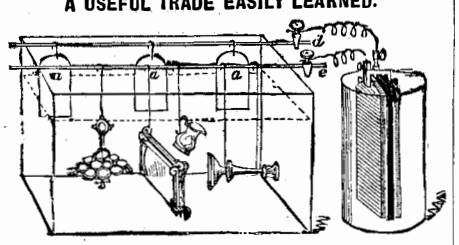
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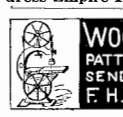
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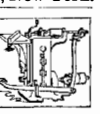

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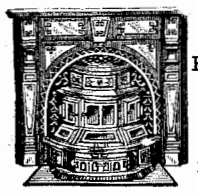

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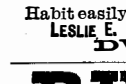

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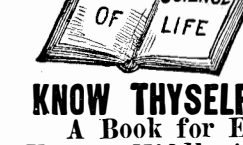

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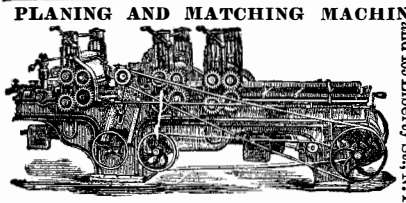

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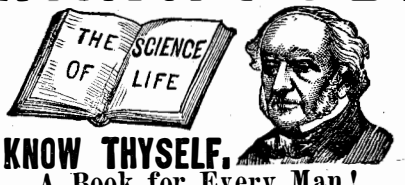

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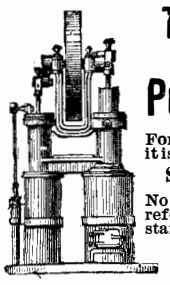

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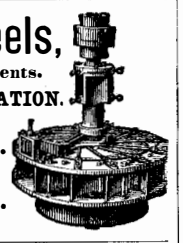

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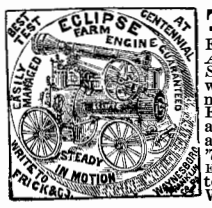

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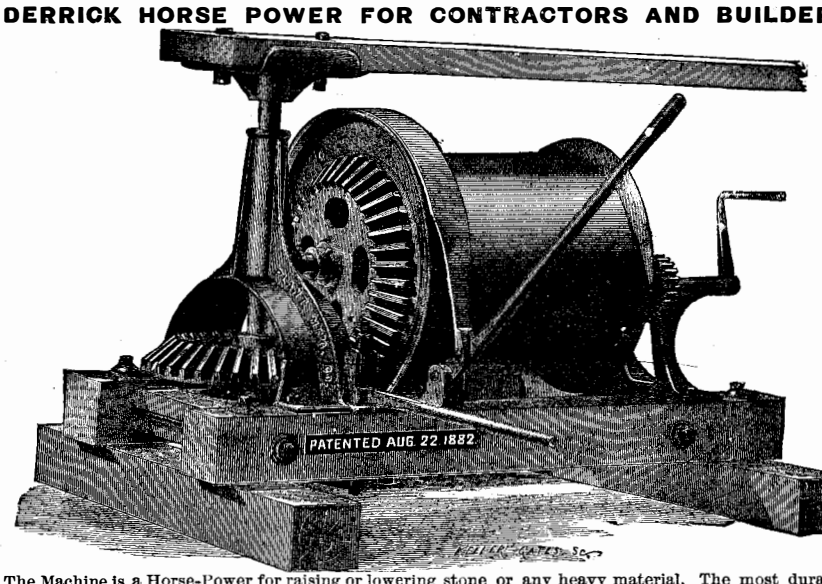

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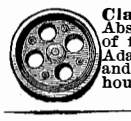

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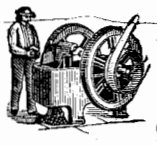

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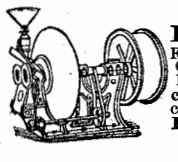

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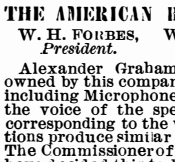

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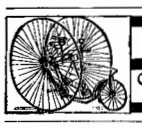

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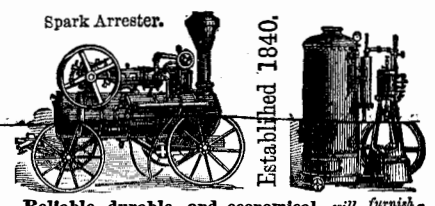

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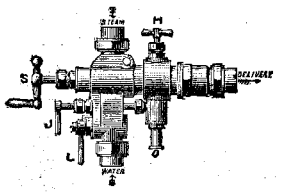

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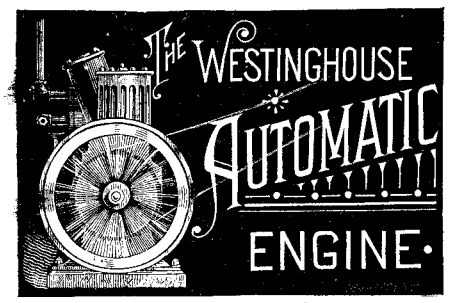

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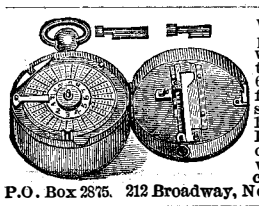

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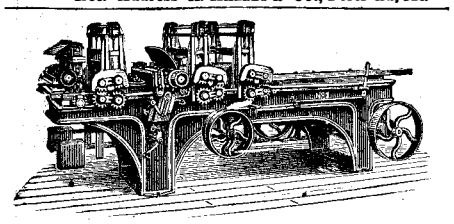

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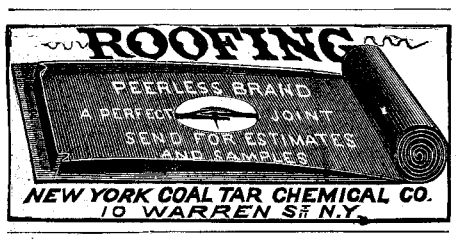

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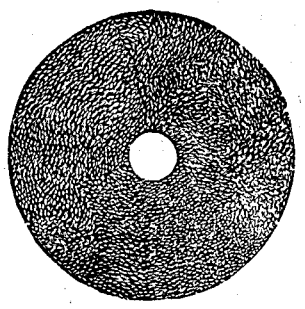

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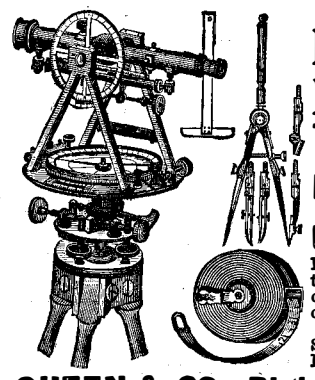

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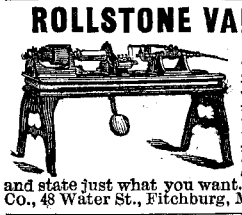

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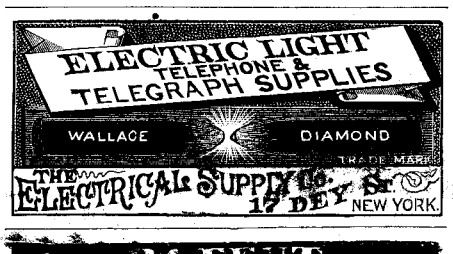

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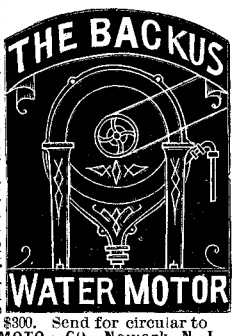

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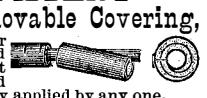

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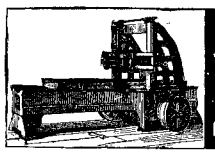

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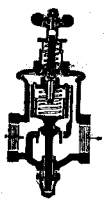

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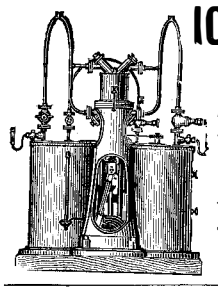

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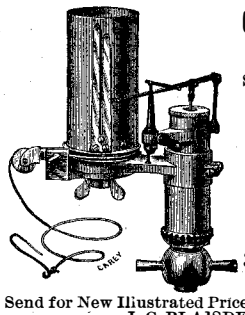

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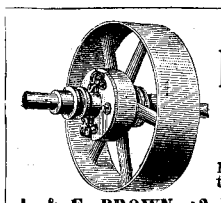

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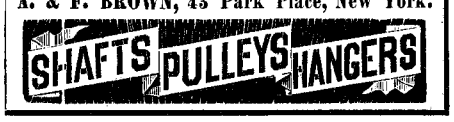

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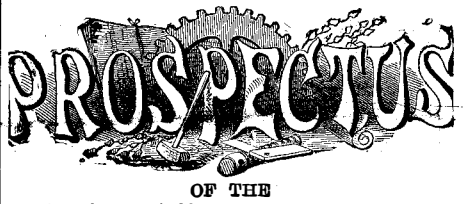

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